GASTROENTEROLOGY

ABSTRACTS AND CITATIONS

NATIONAL INSTITUTE OF ARTHRITIS, METABOLISM, AND DIGESTIVE DISEASES

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PREFACE

GASTROENTEROLOGY ABSTRACTS and CITATIONS is a publication of the National Institute of Arthritis, Metabolism and Digestive Diseases. This specialized information medium has been initiated to fill an existing great need in the field of gastroenterology and to assist the Institute in meeting its obligations to foster and support laboratory and clinical research into the nature, causes, and therapy of diseases of the gastrointestinal tract. Publication GASTROENTEROLOGY ABSTRACTS and CITATIONS makes available citations of all current papers relevant to this field from medical journals published throughout the world. Approximately one-third of the citations dealing with the major aspects of gastroenterology have accompanying abstracts.

The issuing of GASTROENTEROLOGY ABSTRACTS and CITATIONS under the auspices of the National Institute of Arthritis, Metabolism, and Digestive Diseases will provide a much needed current awareness tool to scientists and will facilitate greater integration of research and clinical efforts in this field. The number and great diversity of publications in the area of gastroenterology makes it imperative that an appropriate service be available to investigators and practitioners so that they may be apprised of progress with a minimum of delay. Our aim is to provide the readers with a readily systematized compilation of current published work. The publication will provide the greatest usefulness if these interested investigators will contribute their ideas and comments for consideration whenever possible.

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CONTENTS

	Abstracts, Citations	Page
PRE-CLINICAL SCIENCES		
Morphology, Cellular Structure and Histochemistry	.1694-1703	227
Absorption--Excretion--Transport	.1704-1743	229
Motility	.1744-1786	236
Secretion and Metabolism	.1787-1791	244
Stomach	.1792-1848	245
Pancreas	.1849-1878	254
Hepatobiliary Tract	.1879-1963	259
Intestine	.1964-1982	270
General	.1983-1993	272
DIAGNOSTIC PROCEDURES	.1994-2058	275
GASTROINTESTINAL DISEASES		
Esophagus	.2059-2110	281
Stomach	.2111-2162	287
Peptic Ulcers	.2163-2200	290
Small Intestine	.2201-2222	294
Malabsorption	.2223-2234	297
Large Intestine	.2235-2286	298
Ulcerative Colitis	.2287-2296	303
Pancreas	.2297-2310	304
Pancreatitis	.2311-2325	307
Liver and Biliary Tract	.2326-2362	309
Hyperbilirubinemic States	.2363-2364	313
Nonviral Hepatitis and Hepatic Injury	.2365-2371	313
Acute Viral Hepatitis	.2372-2411	314
Chronic Hepatitis	.2412-2418	317
Alcoholic Liver Disease	.2419-2429	318
Cirrhosis	.2430-2467	318
Gallbladder and Biliary Tract Diseases	.2468-2540	322
General	.2541-2614	328
Parasitology	.2615-2622	334
Regional Enteritis	.2623-2628	335
AUTHOR INDEX		
SUBJECT INDEX		

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NOTE

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LANGUAGE ABBREVIATIONS

Afrikaans	Afr.	Georgian	Geo.	Persian	Per.
Albanian	Alb.	German	Ger.	Polish	Pol.
Arabic	Ara.	Greek	Gre.	Portuguese	Por.
Armenian	Arm.	Hausa	Hau.	Pushto	Pus.
Azerbaijani	Aze.	Hebrew	Heb.	Rumanian	Rum.
Belorussian	Bel.	Hindi	Hin.	Russian	Rus.
Bengali	Ben.	Hungarian	Hun.	Serbian	Ser.
Bulgarian	Bul.	Icelandic	Ice.	Slovak	Slo.
Burmese	Bur.	Indonesian	Ind.	Slovene	Slv.
Chinese	Chi.	Interlingua	Int.	Spanish	Spa.
Croatian	Cro.	Italian	Ita.	Swahili	Swa.
Czechoslovakian	Cze.	Japanese	Jpn.	Swedish	Swe.
Danish	Dan.	Kirghiz	Kir.	Tagalog	Tag.
Dutch	Dut.	Korean	Kor.	Tamil	Tam.
English	Eng.	Latin	Lat.	Telugu	Tel.
Esperanto	Esp.	Latvian	Lav.	Thai	Tha.
Estonian	Est.	Lithuanian	Lit.	Turkish	Tur.
Finnish	Fin.	Marathi	Mar.	Ukranian	Ukr.
Flemish	Fle.	Masai	Mas.	Urdu	Urd.
French	Fre.	Multilingual	Mlt.	Vietnamese	Vie.
Gaelic	Gae.	Norwegian	Nor.	Welsh	Wel.

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone	ml, µl	milli-, microliter(s)
ADP	adenosine diphosphate	mm	millimeter(s)
AMP	adenosine monophosphate	mOsm	milliosmolar; milliosmeter(s)
amp	ampere	msec	millisecond(s)
ATP	adenosine triphosphate	mV	millivolt(s)
A	angstrom	min	minute(s)
BSP	sulfobromophthalein	MTD	maximum tolerated dose
C	degrees centigrade	NAD	nicotinamide adenine dinucleotide
cal	calories	NADH	reduced nicotinamide adenine dinucleotide
cc	cubic centimeter		
cm	centimeter(s)	NADP	nicotinamide adenine dinucleotidephosphate
dl	deciliter		
DNA	deoxyribonucleic acid	NADPH	reduced nicotinamide adenine dinucleotidephosphate
ED_{50}	median effective dose(s)		
EDTA	ethylenediamine tetraacetic acid	ng	nanogram (10^{-9})
e.g.	for example	nm	nanometer(s)
EEG	electroencephalogram	Pa	ambient pressure
ESR	erythrocyte sedimentation rate	PAS	periodic acid - Schiff
g	gram(s)	pg	picogram (10^{-12})
µg	microgram(s)	pgEq	picogram equivalent(s)
Hz	Hertz	p.o.	orally
hr	hour(s)	ppb	parts per billion
Ig	immunoglobulin(s)	ppm	parts per million
i.m.	intramuscular	r	Roentgen
i.p.	intraperitoneal	RBC	red blood cells (erythrocytes), red blood count
IU	international unit(s)		
i.v.	intravenous	resp.	respectively
kcal	kilocalorie(s)	RNA	ribonucleic acid
kg	kilogram(s)	s.c.	subcutaneous
K_m	Michaelis constant	sec	second(s)
LD_{50}	median lethal dose(s)	SGOT	serum glutamic-oxalacetic transaminase
LDH	lactic acid dehydrogenase		
m	meter(s)	SGPT	serum glutamic-pyruvic transaminase
M	molar; mole(s)		
mM	millimolar; millimole(s)	U	unit(s)
µM	micromolar; micromole(s)	UV	ultraviolet
ma	milliampere(s)	V	volt
mCi, µCi	milli-, microcurie(s)	WBC	white blood cells (leukocytes), white blood count
mEq	milliequivalent(s)		
mg	milligram(s)	yr	year(s)

PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

1694 SMALL BOWEL MORPHOLOGY AND EPITHELIAL PROLIFERATION IN INTRAVENOUSLY ALIMENTED RABBITS. (Eng.) Eastwood, G. L. (West Roxbury Veterans Admin. Hosp., 1400 Veterans of Foreign Wars Parkway, West Roxbury, MA 02132). *Surgery* 82(5):613-620; 1977.

To determine whether alterations in epithelial renewal accompany the morphological changes observed in experimental animals on i.v. alimentation, cell proliferation and the light and electron microscopic appearance of the small bowel were investigated in i.v. and p.o. alimented rabbits. After 10 days of either i.v. or p.o. alimentation, ^{3}H-thymidine was given i.v. to all animals, and 1 hr later sections of duodenum, upper jejunum, and distal ileum were taken for autoradiography and light and electron microscopy. Parenteral alimentation was accompanied by significant reductions in epithelial cell proliferation and mucosal thickness in the proximal small bowel. The density of goblet cells was greater in the duodenum and jejunum, but less in the ileum, of i.v. alimented rabbits than in corresponding areas of the animals fed p.o. Furthermore, ultrastructural changes in the villous absorptive cells of i.v. alimented rabbits, such as lengthened microvilli and increased numbers of multivesicular bodies, suggest that epithelial migration also may be slowed during parenteral alimentation.

1695 THE EFFECT OF INTESTINAL RESECTION ON THIRY-VELLA FISTULAE OF JEJUNAL AND ILEAL ORIGIN IN THE RAT: EVIDENCE FOR A SYSTEMIC CONTROL MECHANISM OF CELL RENEWAL. (Eng.) Hanson, W. R.; Rijke, R. P. C.; Plaisier, H. M.; Van Ewijk, W.; Osborne, J. W. (Div. Biological and Medical Res., Argonne Natl. Lab., Argonne, IL 60439). *Cell Tissue Res.* 10(6):543-555; 1977.

To test the hypothesis that steady state cell renewal in the intestinal epithelium is maintained by a systemic, rather than a local, mechanism, the effect of 60% mid-intestinal resection on Thiry-Vella fistulae of both jejunal and ileal origin was studied in rats. Hypoplasia occurred in fistulae without resection of the remaining intestine in continuity. Cell counts of crypt and villus columns and tritiated thymidine uptake in isolated whole crypts were reduced. Scanning electron microscopy showed marked hypoplastic alterations in villi. However, when 60% of the intestine in continuity was resected, hyperplasia occurred not only in the residual intestine but in the fistulae of both jejunal and ileal origin. Cell counts of villus and crypt columns were increased along with increased tritiated thymidine uptake per crypt. Neutral α-glucosidase and nonspecific esterase activities did not change as a result of resection, but the activities of both enzymes were greater in ileal fistulae than in ileum *in situ*. Observations on the different resection response of the jejunal versus ileal fistulae lead to a distinction between inherent and induced differences within the small intestine. This study suggests a systemic control of cell renewal.

1696 MORPHOLOGICAL CHANGES INDUCED BY CYCLOPHOSPHAMIDE IN CRYPT EPITHELIUM OF THE SMALL INTESTINE IN MICE: LIGHT AND ELECTRON MICROSCOPIC STUDIES. (Eng.) Sobhon, P.; Wanichanon, C.; Sretarugsa, P. (Dept. Anatomy, Mahidol Univ., Rama VI Rd., Bangkok 4, Thailand). *Am. J. Anat.* 149(4):563-584; 1977.

The extent of mitotic inhibition and cellular injury in the intestinal crypts were studied in female Swiss mice following the i.p. injection of a single sublethal dose (300 mg/kg) of cyclophosphamide. Within 1 hr, light microscopic observations indicated that mitotic activity of epithelial cells had decreased, reaching the lowest level at 16 hr. An abnormally high number of lymphocytes and cells with eosinophilic granules appeared in the epithelium; later these cells degenerated, and the maximum number of dead cells was observed at 6 hr after the drug injection. At 4 days post-injection, the morphology of crypt epithelium had returned to normal. Electron microscopy revealed that, although the mitotic activity of crypt epithelial cells was depressed, there was little change in their morphology following the drug administration. However, many intermediate stages of degeneration of lymphocytes and eosinophilic cells were observed in the intercellular spaces as well as apparently inside the cytoplasm of crypt epithelial cells. The eosinophilic cells are characterized by the presence of large crystal-containing granules in the cytoplasm, and are believed to be equivalent to "globular leukocytes" described by many investigators. Evidence from this study suggests that lymphocytes and globular leukocytes are more sensitive to cyclophosphamide than are crypt epithelial cells, and that they degenerate in crypt epithelium.

1697 HUMAN ROTAVIRUS ENTERITIS INDUCED IN CONVENTIONAL PIGLETS: INTESTINAL STRUCTURE AND TRANSPORT. (Eng.) Davidson, G. P.; Gall, D. G.; Petric, M.; Butler, D. G.; Hamilton, J. R. (Hosp. Sick Children, Toronto, Ontario, Canada). *J. Clin. Invest.* 60(6):1402-1409; 1977.

To better understand the pathogenesis of infantile viral gastroenteritis, Na^{+} and Cl^{-} fluxes were studied *in vitro* in short-circuited jejunal epithelium from 8- to 10-day-old piglets after infection with a standard p.o. dose of human rotavirus. Eleven infected piglets, all of whom became ill, were compared with nine uninfected, healthy littermates. When killed 72 hr after infection, the intestinal villi were shorter and crypts deeper ($p<0.025$) in the duodenum, upper jejunum, and mid-small intestine, but not ileum, as compared to con-

trol tissue. Virus antigen was seen by fluorescence microscopy in occasional jejunal villus tip cells in only four infected piglets and in none of the controls at 72 hr. Net Na^+ and Cl^- fluxes did not differ from noninfected litter-mate controls under basal conditions, but the response to glucose was blunted in infected piglets ($p<0.001$). Theophylline-stimulated net Cl^- secretion in both infected and control animals, and cyclic AMP concentration in isolated jejunal villus enterocytes did not differ significantly. In isolated jejunal villus enterocytes of infected piglets, thymidine kinase activity increased ($p<0.001$), and sucrase activity decreased ($p<0.001$). It is concluded that in invasive enteritis caused by a major human viral pathogen, glucose-coupled Na^+ transport is impaired in the jejunum at a time when the villus epithelium shows enzyme characteristics of crypt epithelium, and when little or no virus is present. These findings are identical to those occurring in an invasive coronavirus enteritis of piglets but differ markedly from those seen with enterotoxigenic diarrhea.

1698 IMMUNO-ELECTRON-CYTOCHEMICAL LOCALIZATION OF THE SOMATOSTATIN CELLS IN THE HUMAN ANTRAL MUCOSA. (Eng.) Canese, M. G.; Bussolati, G. (Istituto di Anatomia e Istologia Patologica, Univ. Turin, Turin, Italy). *J. Histochem. Cytochem.* 25(10):1111-1118; 1977.

Specific immunocytochemical and light and electron microscopic methods were used to identify the somatostatin-containing cells of the human antral mucosa. By means of immunoperoxidase and immunofluorescence methods sequentially applied on the same section, the somatostatin cells were shown to be distinct from the gastrin cell population; these two endocrine cell types were often closely related. On ultrathin sections from aldehyde-fixed, Epon-araldite embedded tissues, the site of storage of somatostatin was localized with the peroxidase-antiperoxidase complexes technique after removal of the resin by means of sodium ethoxide. This procedure represents a new technical approach to the use of electron-cytochemical techniques. The results indicate that somatostatin is localized in the endocrine granules of the D cells.

1699 SUBSEGMENTATION OF THE HUMAN LIVER. (Eng.) Gupta, S. C.; Gupta, C. D.; Arora, A. K. (Dept. Anatomy, S.N. Medical Coll., Agra, India). *J. Anat.* 124(2):413-423; 1977.

The normal topographical arrangement of human hepatic subsegments, with special reference to abnormal variations, was examined in 85 livers obtained within 24 hr of death from subjects of all ages. Colored corrosion casts of the portal vein, hepatic duct, and hepatic artery were prepared with applications of colored 18% butyl butyrate solution in acetone. Hepatic subsegments were identified by the independence of their vessels and ducts from those of neighboring territories. The following hepatic subsegments were distinguished: (1) posterior, (2) posterior inferior, (3) anterior superior, (4) anterior inferior, (5) medial superior, (6) medial inferior, (7) lateral superior, (8) lateral inferior, and (9) caudate. The sizes of the subsegments were very similar in 41 cases (48.2%). In the others, some increase or decrease in size of one or more subsegments at the expense of the neighboring subsegments was observed. Resection of a portion of the liver should not be performed without previous identification of hepatic subsegments by cholangiography or portovenography.

1700 MORPHOLOGICAL EXAMINATION OF ESOPHAGUS STOMACH AND ESOPHAGUS INTESTINE ANASTOMOSES FOLLOWING PREOPERATIVE RADIATION THERAPY. (Ger.) Izabekov, Z. B.; Kolyceva, N. I.; Chan, S. V.; *et al.* (Kazakhstan Scientific Res. Inst. Oncology, Radiology, Alma Ata, USSR). *Radiobiol. Radiother. (Berl.)* 17(2):305-312; 1976.

1701 THE EVOLUTION OF MUCOSAL CHANGES IN EXPERIMENTAL GASTROESOPHAGEAL REFLUX ON HISTOPATHOLOGY AND SURFACE MICROSCOPY [Abstract]. (Eng.) Schulze, K.; Mitros, F.; Christensen, J.; Shirazi, S.; Ackerman, L. (Coll. Medicine, Univ. Iowa, Iowa City, IA 52242). *Clin. Res.* 25(4):574A; 1977.

1702 STRUCTURE AND FUNCTION OF THE MOUSE SMALL INTESTINE AFTER INFECTION WITH Schistosoma mansoni [Abstract]. (Eng.) Vengesa, P. B.; Leese, H. J. (Dept. Biology, Univ. York, York, England). *Gut* 18(11):A965-A966; 1977.

1703 ENDOSCOPIC OBSERVATION OF THE GASTRIC MUCUS IN VIVO STAINED WITH AZURE A. (Eng.) Kamada, T.; Hiramatsu, K.; Fusamoto, H.; *et al.* (Osaka Univ. Medical Sch., Osaka, Japan). *Am. J. Gastroenterol.* 65(6):532-538; 1976.

See also, 1724, 1767, 1790, 1795, 1797, 1798, 1803, 1816, 1818, 1879, 1924, 1927, 1931, 1966, 1972, 1973, 1985, 1989, 2213, 2217, 2229, 2239, 2345, 2570, 2571, 2600, 2617.

1704 PARACELLULAR PERMEABILITY OF EXTRACELLULAR SPACE MARKERS ACROSS RAT JEJUNUM IN VITRO. INDICATION OF A TRANSEPITHELIAL FLUID CIRCUIT. (Eng.) Munck, B. G.; Rasmussen, S. N. (Inst. Medical Physiology A, Univ. Copenhagen, Copenhagen, Denmark). *J. Physiol. (Lond.)* 271(2):473-488; 1977.

The characteristics of [^{51}Cr]EDTA, [^{3}H]methoxyinulin ([^{3}H]MI), [^{14}C]polyethylene glycol-4000 ([^{14}C]PEG), and [^{3}H]mannitol as markers of the extracellular space (ECS) of isolated mucosa from the rat small intestine were examined. Unidirectional transmural fluxes across the rat jejunum of [^{3}H]MI, [^{14}C]PEG, and [^{3}H]mannitol were measured in the absence of glucose or in the presence of 28 mM glucose. Assuming that [^{14}C]PEG does not enter the cells, [^{51}Cr]EDTA and [^{3}H]mannitol seemed to have access to approximately 50% and 90% of the intracellular water, resp. The commercially available [^{3}H]MI had access to a space that exceeded the [^{14}C]PEG space by 10%. Upon purification by gel filtration, the high molecular weight fraction of the [^{3}H]MI provided estimates of the ECS identical with the estimates obtained with [^{14}C]PEG. For all the markers used, the ECS estimates remained constant between the 40th and 80th min of incubation. In the absence of glucose, the transepithelial net fluxes of each of the different markers were zero. In the presence of 28 mM glucose, the serosa-to-mucosa fluxes of all markers were dramatically increased. The ratio between the serosa-to-mucosa and the mucosa-to-serosa fluxes increased in the order [^{3}H]mannitol>[^{3}H]MI>[^{14}C]PEG. The effect of glucose on the flux ratio of the marker substances suggests that glucose-induced net water transport to the serosal side of the gut wall represents the difference between a transcellular net water transport to the serosal side and a significant paracellular net water transport through the lateral intercellular spaces to the mucosal solution.

1705 THE IMPORTANCE OF THE INTESTINAL COUNTER-CURRENT EXCHANGER FOR ^{85}Kr ABSORPTION FROM THE FELINE GUT. (Eng.) Jodal, M.; Svanik, J.; Lundgren, O. (Dept. Physiology, Univ. Goteborg, Goteborg, Sweden). *Acta Physiol. Scand.* 100(4):412-423; 1977.

The relationships between intestinal absorption rate and blood flow and between absorption rate and intraluminal pressure were studied in cats. The rate of ^{85}Kr absorption from the gut was studied at varying intestinal blood flows induced by intra-arterial infusions of a vasodilator drug or by lowering arterial inflow pressure. The effects on rate of absorption of distending the intestine by increasing intraluminal pressure from 0-1 to 5-7 cm H_2O as well as of augmenting the rate of luminal perfusion of the ^{85}Kr solution were also investigated. Distending the small bowel increased rate of ^{85}Kr absorption at all levels of intestinal blood flow except at the very low and the very high blood flow rates. Decreasing blood flow by lowering the arterial perfusion pressure decreased the rate of absorption from the distended gut while it had no effect in the collapsed small intestine. Increasing the rate of luminal perfusion enhanced the rate of ^{85}Kr absorption at all blood flow levels except at the lowest ones. It is concluded that the countercurrent exchanger represents, under physiological conditions, the major limiting factor for the absorption of lipophilic solutes such as ^{85}Kr.

1706 THE ROLE OF ACETYLCHOLINE IN THE REGULATION OF ION TRANSPORT BY RAT COLON MUCOSA. (Eng.) Browning, J. G.; Hardcastle, J.; Hardcastle, P. T.; Sanford, P. A. (Dept. Physiology, Univ. Sheffield, Sheffield, England). *J. Physiol. (Lond.)* 272(3): 737-754; 1977.

The possibility that colonic ion transport mechanisms might be under cholinergic control was investigated by determining the effect of acetylcholine on the transport activity of the rat colon. Acetylcholine (3 µg i.v. *in vivo*; 25 mM *in vitro*) increased the potential difference across rat proximal colon. There was a sigmoid relationship between the change in potential difference and the logarithm of the dose of acetylcholine. The dose-response curve was shifted to the left *in vivo* by neostigmine (10 µg) and to the right by atropine (2 µg), suggesting that the action of acetylcholine is mediated by a muscarinic type of receptor. The dose-response curve for acetylcholine *in vivo* was not altered by the ganglion-blocking agents hexamethonium (100 µg) and pentolinium (25 µg), suggesting a direct effect of this transmitter on the colon. Acetylcholine caused an increase in potential difference, a small decrease in resistance, and, hence, a rise in the current generated by both normal and stripped everted sacs of rat colon. In the absence of sodium, the calculated current change produced by acetylcholine was reduced, and the removal of chloride had a similar inhibitory effect. The absence of bicarbonate did not significantly affect the response. Acetylcholine virtually abolished net sodium movement and induced net chloride secretion, and these changes accounted for the increased short-circuit current. Acetylcholine had no effect on oxygen consumption by rings of colon. Tracts staining for acetylcholinesterase were observed running from the submucous plexus towards the mucosal epithelium. The results demonstrate that acetylcholine can influence ion movement by rat colonic mucosa and suggest that the autonomic nervous system might be involved in the regulation of transport mechanisms in this tissue.

1707 THE EFFECT OF ETHANOL AND BILE ON ELECTROLYTE MOVEMENT ACROSS CANINE PROXIMAL DUODENAL MUCOSA. (Eng.) Himal, H. S.; Greenberg, L. (Royal Victoria Hosp., 687 Pine Ave. W., Montreal, Quebec H3A 1A1, Canada). *Am. J. Gastroenterol.* 68(1):45-50; 1977.

The effect of ethanol and bile on electrolyte movement across the duodenal mucosa was examined in 10 dogs. Duodenal explants from the dogs with an intact blood supply were placed within lucite cham-

bers. Under basal conditions there was H^+ insorption and Na^+ exsorption. Neither bile nor ethanol (20%) caused increased the H^+ Na^+ flux. Acute erosions did not develop in the proximal duodenum, as has been previously shown to occur when bile or ethanol is instilled into the stomach. These studies demonstrate that although H^+ Na^+ flux occurs across the duodenal mucosa, bile or ethanol do not cause changes in ionic flux and acute erosions do not develop.

1708 ALTERATION OF LARGE INTESTINAL ELECTROLYTE TRANSPORT BY VASOACTIVE INTESTINAL POLYPEPTIDE IN THE RAT. (Eng.) Racusen, L. C.; Binder, H. J. (Dept. Internal Medicine, Yale Univ., 333 Cedar St., New Haven, CT 06510). *Gastroenterology* 73(4, Part 1):790-796; 1977.

The effect of vasoactive intestinal polypeptide (VIP) on Na and Cl transport across isolated large intestinal epithelia under short-circuited conditions was evaluated in the rat, since some evidence suggests that this intestinal hormone may not affect colonic ion transport. An increase in short-circuit current and potential difference was produced by the addition of VIP to the serosal media at concentrations as low as 10^{-9} M, and maximal increments were observed at 10^{-7} M. In control mucosa, the net sodium flux was 4.93 ± 0.52 μEq/hr/cm^2. The addition of VIP (6×10^{-7} M) resulted in a decrease in net sodium flux (0.87 ± 0.46 μEq/hr/cm^2), a reversal of Cl absorption to Cl secretion (-2.42 ± 1.12 μEq/hr/cm^2), and an increase in short-circuit current. Unidirectional mucosal to serosal fluxes of both Na and Cl decreased. The changes produced by VIP were identical with those induced by 10 mM theophylline. The effect of VIP plus theophylline on the net sodium flux and short-circuit current were indistinguishable from those of VIP alone and theophylline alone. VIP also increased mucosal cyclic AMP content. These studies indicate that VIP alters large intestinal ion transport; these changes are most likely mediated by increased mucosal levels of cyclic AMP.

1709 ADENOSINE UPTAKE BY THE ISOLATED EPITHELIUM OF GUINEA PIG JEJUNUM. (Eng.) Kolassa, N.; Stengg, R.; Turnheim, K. (Pharmakologisches Institut, Universitat Wien, Wahringerstr. 13A, A-1090 Vienna, Austria). *Can. J. Physiol. Pharmacol.* 55(5):1033-1038; 1977.

The respective roles of passive diffusion and of carrier-mediated transfer in the uptake of adenosine by the intestinal epithelium were studied in the isolated guinea pig jejunal epithelium. The uptake of [8-^{14}C]adenosine was faster than that of inosine, hypoxanthine, or adenine. The initial velocity of adenosine uptake from both the luminal and the antiluminal side of the epithelium exhibited saturation kinetics. The apparent K_m, V, and passive permeability of luminal adenosine uptake were all lower than the corresponding values of antiluminal uptake. *p*-Nitrobenzylthioguanosine inhibited adenosine uptake from both the luminal and the antiluminal side, while hexobendine decreased the uptake only from the antiluminal side of the epithelium. The results suggest that adenosine enters the intestinal epithelium by a carrier-mediated process in addition to that of passive diffusion. The antiluminal transport system for adenosine seems similar to that of other tissues with respect to hexobendine inhibition; the luminal transport mechanism, however, exhibits different properties, being insensitive to hexobendine.

1710 AMINO ACID ABSORPTION ALONG THE INTESTINAL TRACT OF CHICKS FED HEATED AND RAW SOYBEAN MEAL. (Eng.) Bielorai, R.; Tamir, M.; Hurwitz, S. (Inst. Animal Sciences, Agricultural Res. Organization, Volcani Center, Bet Dagan, Israel). *J. Nutr.* 107(10):1775-1778; 1977.

Net absorption of individual amino acids along the intestinal tract was determined in chicks fed heated soybean meal (HS) and raw soybean meal (RS), using ^{91}Y as a reference substance. In the duodenum of chicks fed either diet, the absorption of the amino acids varied. In chicks fed the RS diet, the differences were greater than in chicks fed the HS diet, and most of the values were negative. Methionine was the most rapidly and extensively (82%) absorbed amino acid. No cystine was found in the upper parts of the intestinal tract of chicks fed either diet. A linear relationship was obtained between the amino acid absorption values in the duodenum of chicks fed either diet. The differences may be due to nitrogen secretion, which is known to be enhanced in RS-fed chicks. The differences between individual amino acid absorption decreased gradually in the other segments and attained in the lower ileum an average cumulative value of 90% and 70% in chicks fed on HS and RS, resp. The 20% difference is probably a result of the inhibited digestion in the intestine (duodenum excluded) of chicks fed RS. The results indicate that absorption can proceed even when digestion is inhibited.

1711 A REAPPRAISAL OF 'OSMOTIC' EVIDENCE FOR INTACT PEPTIDE ABSORPTION. (Eng.) Fairclough, P. D.; Silk, D. B.; Webb, J. P. W.; Clark, M. L.; Dawson, A. M. (St. Bartholomew's Hosp., London EC1A 7BA, England). *Clin. Sci. Mol. Med.* 53(3):241-248; 1977.

The validity of evidence for intact peptide absorption, derived from analysis of the relation of water and total solute absorption, was tested in the normal human jejunum. Jejunal solute and water absorption from saline solutions of the disaccharide maltose was studied by a double-lumen perfusion technique with a proximal occlusive balloon. It was expected that maltose would yield very different results from peptides, but this expectation was not confirmed by this experiment. The assumption that the absorbate is always isotonic with plasma was tested by altering the osmolality of

glucose/saline solutions perfused in the jejunal lumen. This assumption was not substantiated by experiment, when the luminal fluid was hypertonic to plasma, so was the absorbate. The findings with peptides and disaccharides may be explained as the production of a hypertonic absorbate by hydrolysis of these solutes to their monomer units. It is therefore concluded that analyses of the relation of net solute and water absorption cannot be used to predict the form in which peptides enter the mucosal cells.

1712 THE NUMBER OF GLYCINE RESIDUES WHICH LIMITS INTACT ABSORPTION OF GLYCINE OLIGOPEPTIDES IN HUMAN JEJUNUM. (Eng.) Adibi, S. A.; Morse, E. L. (Univ. Pittsburgh Sch. Medicine, Pittsburgh, PA 15213). *J. Clin. Invest.* 60(5):1008-1016; 1977.

Studies were carried out in 28 healthy subjects to determine whether glycine peptides of four or more glycine residues can be transported by the peptide carrier system, previously shown to transport diglycine and triglycine. When the jejunum was perfused with tetraglycine solutions, the rate of tetraglycine disappearance increased linearly as the concentration was increased over the range of 12.5-50 mM; however, the rate was slow in comparison to diglycine and triglycine disappearance rates. Glycylleucine, a competitive inhibitor of diglycine and triglycine transport, was without effect on the disappearance rate of tetraglycine, but increased the appearance rates of triglycine and diglycine by over sixfold. These products were the results of hydrolysis of tetraglycine by the brush border enzymes, because the cytosol fraction lacked any hydrolase activity against tetraglycine. When a jejunal ring preparation from Sprague-Dawley rats was incubated with tetraglycine, there was intracellular accumulation of diglycine and triglycine but not of tetraglycine. The rates of glycine uptake were always markedly greater from diglycine and triglycine solutions than from corresponding glycine or tetraglycine solutions; rates of glycine uptake from tetraglycine solutions were either similar to or greater than rates from glycine solutions, depending on the infusion concentration. When the number of glycine residues was increased to hexaglycine, the phenomenon of a greater rate of glycine uptake from a peptide versus a free amino acid solution was no longer apparent. *In vitro* assay of peptide hydrolase activity of the luminal fluid revealed no activity against diglycine and triglycine and only trace activities against tetraglycine, pentaglycine, and hexaglycine. The observations suggest that (a) the disappearance of tetraglycine in the human jejunum is accomplished principally via hydrolysis by brush border oligopeptidases, and (b) the rate limiting step in the uptake of glycine from tetraglycine or higher peptides is due to hydrolysis of these peptides to absorbable products.

1713 IONIC FLUX ACROSS CANINE DUODENUM: MOVEMENT OF BICARBONATE. (Eng.) Himal, H. S.; Rudick, J. (Royal Victoria Hosp., 687 Pine Ave. W., Montreal, Quebec H3A 1A1, Canada). *Am. J. Gastroenterol.* 67(6):574-579; 1977.

The effect of isosmotic biocarbonate-rich solutions on the Brunner's gland area were studied in proximal duodenal explants in eight anesthetized dogs. Volume gain occurred with all instillates and varied indirectly with the concentration of the bicarbonate in the instilled solutions. Net bicarbonate gain occurred with instillate of 40 mEq/l; net insorption occurred with instillates of higher bicarbonate concentration (40-80 mEq/l), the rate of which was dependent on the instillate concentration. Insorption of chloride occurred with the less concentrated bicarbonate solutions (40-80 mEq/l), and enterosorption occurred at higher concentrations (80-120 mEq/l). The modification of intraluminal bicarbonate by the proximal duodenal mucosa is important in the regulation of intraduodenal pH. The abnormal function of this mechanism may play a role in the pathogenesis of duodenal ulceration because of incomplete hydrochloric acid neutralization.

1714 ROLE OF PANCREATIC CHOLESTEROL ESTERASE IN THE UPTAKE AND ESTERIFICATION OF CHOLESTEROL BY ISOLATED INTESTINAL CELLS. (Eng.) Gallo, L. L.; Newbill, T.; Hyun, J.; Vahouny, G. V.; Treadwell, C. R. (George Washington Univ. Sch. Medicine and Health Sciences, Washington, DC 20037). *Proc. Soc. Exp. Biol. Med.* 156(2):277-281; 1977.

To determine if the component in pancreatic juice that is essential for cholesterol absorption is pancreatic cholesterol ester hydrolase (CEH) and to investigate whether cholesterol uptake by the intestinal cell is independent of CEH, isolated intestinal mucosal cells from normal and common duct-cannulated rats were prepared by collagenase dissociation. These cells displayed ultrastructural integrity and retained several metabolic characteristics typical of intact intestinal mucosa. These characteristics included galactose accumulation and its inhibition by dinitrophenol, glucose oxidation, incorporation of labeled leucine into cellular protein, and the uptake and esterification of fatty acid. Cholesterol uptake by cells from common duct-cannulated rats was comparable to that in cells from control animals; however, esterification was only about 25% of that in control cells. Preincubation of the "defective" cells for 30 min with the purified subunit or active form of pancreatic sterol ester hydrolase had no effect on cholesterol uptake but resulted in a fourfold to sixfold increase in the ability of the cells to esterify cholesterol. These studies provide additional evidence for the essential role of pancreatic sterol ester hydrolase in the mucosal esterification of absorbed cholesterol prior to lymphatic transport.

1715 ABSORPTION, PLASMA TRANSPORT, AND CELLULAR RETENTION OF COBALAMIN ANALOGUES IN THE RABBIT: EVIDENCE FOR THE EXISTENCE OF MULTIPLE MECHANISMS THAT PREVENT THE ABSORPTION AND TISSUE DISSEMINATION OF NATURALLY OCCURRING COBALAMIN ANALOGUES. (Eng.) Kolhouse, J. F.; Allen, R. H. (Univ. Colorado

Medical Center, Denver, CO 80220). *J. Clin. Invest.* 60(6):1381-1392; 1977.

Cobalamin (Cbl) analogues containing ^{57}Co and ^{58}Co were synthesized, and their gastrointestinal absorption, plasma transport, and cellular retention in rabbits were compared with those of [^{58}Co]Cbl. Many of the Cbl analogues were bound with low affinity by intrinsic factor, and none of the [^{57}Co]-Cbl analogues were taken up by the ileum or absorbed into the body in amounts comparable to that of [^{58}Co]Cbl. The analogues that were bound by intrinsic factor with high affinity were taken up by the ileum but, in many cases, they were retained there in significant amounts. Most analogues were bound by plasma transcobalamin II with high affinity, and all of these transcobalamin II-[^{57}Co]-Cbl analogue complexes were taken up by a variety of tissues in a manner that was indistinguishable from that of transcobalamin II-[^{58}Co]Cbl. The few analogues that were bound by transcobalamin II with low affinity were taken up by tissues in lesser amounts, and 20-70% of these analogues was rapidly excreted in the urine. All Cbl analogues were bound by the granulocyte R-type Cbl-binding protein with high affinity, and all of the R-type protein-[^{57}Co]-Cbl analogue complexes were cleared rapidly from plasma exclusively by hepatocytes, as occurred with R-type protein-[^{58}Co]Cbl. Some Cbl analogues were released back into the plasma and were disseminated among a variety of tissues via transcobalamin II as occurred with native Cbl. Other Cbl analogues were retained in the liver and eventually excreted in the feces and urine without accumulating in other tissues. These studies indicate that intrinsic factor and the ileum prevent certain Cbl analogues from entering the body and that the granulocyte R-type protein and hepatocytes prevent the dissemination of certain Cbl analogues that may gain entry such as during infections with Cbl analogue-producing bacteria. The fact that transcobalamin II binds and transports a large number of Cbl analogues indicates that these protective mechanisms can be circumvented and supports the feasibility of using Cbl analogues as antimetabolites *in vivo*.

1716 ENERGETICS OF Na^+-DEPENDENT SUGAR TRANSPORT BY ISOLATED INTESTINAL CELLS: EVIDENCE FOR A MAJOR ROLE FOR MEMBRANE POTENTIALS. (Eng.) Kimmich, G. A.; Carter-Su, C.; Randles, J. (Univ. Rochester Medical Center, Rochester, NY 14642). *Am. J. Physiol.* 233(5):E357-E362; 1977.

The mechanics of Na^+-dependent sugar transport by isolated intestinal cells were studied. Intestinal epithelial cells isolated from 6-week-old chickens maintained the capability for Na^+-dependent concentrative accumulation of 3-*O*-methylglucose (3-OMG). Cells depleted of ATP exhibited a transient accumulation of 3-OMG in response to imposed Na^+ gradients or when transmembrane ion diffusion potentials (cell interior negative) were established. Phlorizin or lack of extracellular Na^+ prevented the formation of sugar gradients in every case. A nonconcentrative, non-Na^+-dependent sugar transport system was also operative in these cells. The latter system was inhibited to various degrees by phloretin, theophylline, cytochalasin B, and a variety of flavonones and flavones, including apigenin. These agents also inhibited sugar efflux from the cell via this pathway. The concentrative system normally operates against a "leak" of sugar through the nonconcentrative carrier. If the passive system was made inoperative by any of the agents named above, a significant enhancement of steady-state sugar gradients maintained by the cells was observed. With cytochalasin B, gradients as large as 30-fold were established. The energy inherent in cellular Na^+ gradients could not account for sugar gradients of this magnitude unless both chemical and electrical driving forces were considered. When the passive leak was maximally inhibited, more than half of the total energy required had to be derived from the membrane potential.

1717 UNSTIRRED LAYER AND KINETICS OF ELECTROGENIC GLUCOSE ABSORPTION IN THE HUMAN JEJUNUM IN SITU. (Eng.) Read, N. W.; Barber, D. C.; Levin, R. J.; Holdsworth, C. D. (Royal Infirmary, Sheffield, England). *Gut* 18(11):865-876; 1977.

Using an electrical technique, the thickness of the unstirred layer in the human jejunum was estimated during kinetic studies of electrogenic glucose absorption to determine whether differences in the thickness of the unstirred layer could explain the low apparent K_m and maximum potential difference (PDmax) for the active electrogenic component of glucose absorption in untreated celiac disease. The unstirred layer in 7 healthy volunteers (632 ± 24 μM) was significantly thicker than in 10 patients with active celiac disease (442 ± 23 μm) but not significantly different in 7 patients who had responded to treatment by gluten withdrawal (585 ± 49 μm). There were similar differences in the values of apparent K_m for electrogenic glucose absorption between healthy controls (36 ± 6 mM), active celiac patients (11 ± 1 mM), and treated celiac patients (31 ± 5 mM). The changes in PDmax, however, showed a different pattern. The PDmax in the active celiac group (6.8 ± 0.7 mV) was lower than in controls (7.6 ± 0.6 mV) but not significantly so, while the PDmax in the treated celiac group (10.6 ± 0.9 mV) was significantly higher than in both the active celiac and control groups. Analysis of the results using a computer simulation indicated that the reduction in apparent K_m in active celiac disease can be caused by the interaction of the decreased maximal absorption rate for glucose with the attenuated unstirred layer. In these circumstances it is not necessary to postulate any change in the affinity of the transport mechanism for glucose ("real K_m").

1718 LACTOSE AND PROTEIN ABSORPTION FROM BREAST MILK AND COW'S MILK PREPARATIONS AND ITS INFLUENCE ON THE INTESTINAL FLORA: INVESTIGATIONS ON TWO INFANTS WITH AN ARTIFICIAL ANUS. (Eng.) Heine, W.; Zunft, H. J.; Muller-Beuthow, W.; Grutte,

F. K. (Dept. Pediatrics, Wilhelm-Pieck-Univ., 25 Rostock, E. Germany). *Acta Paediatr. Scand.* 66(6): 699-703; 1977.

Lactose and nitrogen balance studies were carried out in two 4-month-old infants with an artificial anus, who were fed either breast milk or a cow's milk preparation, to determine whether the lactose in human breast milk is absorbed less well than the lactose in cow's milk. The concentrations of protein, lactose, glucose, and galactose were measured in the fistula stools, and the fecal bacteria were identified and quantitated. There were relatively high concentrations of lactose and its decomposition products and low concentrations of protein and amino nitrogen in the fistula stools when breast milk was fed. When the cow's milk formula was fed, only traces of lactose but high amounts of protein were present. Higher total intestinal bacteria counts were found in the stools of the infant fed the cow's milk formula. These results support the hypothesis that the lactose from breast milk is not absorbed as well as that in cow's milk. They also indicate that the bacterial flora of the large intestine is influenced by lactose and protein concentrations.

1719 STUDIES OF TRANSLOCATION OF IMMUNOGLOBULINS ACROSS INTESTINAL EPITHELIUM. IV. EVIDENCE FOR BINDING IgA AND IgM TO SECRETORY COMPONENT IN INTESTINAL EPITHELIUM. (Eng.) Brown, W. R.; Isobe, K.; Nakane, P. K.; Pacini, B. (Veterans Admin. Hosp., 1055 Clermont St., Denver, CO 80220). *Gastroenterology* 73(6):1333-1339; 1977.

Studies were carried out to determine whether secretory component (SC) is a specific receptor on intestinal epithelial cells for IgA and IgM. Initially, frozen sections of human intestinal mucosa were incubated with dimeric monoclonal human IgA_1 conjugated to horseradish peroxidase; adjacent sections were reacted with peroxidase-conjugated antibodies to SC. The conjugated IgA and anti-SC bound to similar sites in the epithelium, that is to basolateral margins and supranuclear cytoplasm of columnar epithelial cells, principally in gland crypts. Binding of the dimeric IgA conjugate was inhibited by pretreating the tissues with unconjugated dimeric IgA or 19S IgM, pretreating the tissues with unconjugated antibodies to SC, or preincubating the dimeric IgA conjugate with free SC. Binding was not inhibited or only partially inhibited by pretreating the tissues with monomeric IgA or IgG, pretreating the tissues with antibodies to human or heterologous immunoglobulins, or preincubating the dimeric IgA conjugate with 11S secretory colostral IgA. The findings indicate that dimeric IgA and 19S IgM are capable of binding *in vitro* to specific sites on intestinal epithelial cells, most likely to SC. This supports the hypothesis that transport of these immunoglobulins into intestinal fluids involves their combination with SC in the epithelium.

1720 ABSORPTION OF HORSERADISH PEROXIDASE BY THE PRINCIPAL CELLS OF THE LARGE INTESTINES OF POSTNATAL DEVELOPING RATS. (Eng.) Ono, K. (Iwate Medical Univ., Morioka, Japan). *Anat. Embryol.* 151(1):53-62; 1977.

The absorption of horseradish peroxidase in the rat large intestine during postnatal development was investigated by cytochemical and ultrastructural methods. In the ceca and ascending colons from 4-, and 5-day-old rats, intraluminaly injected peroxidase (20 mg/ml) became localized on microvilli, in the intracytoplasmic network of the apical tubules and small vacuoles (tubulo-vacuolar system), in the large supranuclear vacuole, in the Golgi apparatus, on the lateral and basal cell membranes of the surface principal cells, and also in the lumen of blood capillaries in the subjacent propria. The protein tracer was not seen in the large intestinal epithelial cells that lack tubulo-vacuolar systems and large supranuclear vacuoles within their cytoplasm. In the descending colons of rats of any postnatal age (0-25 days, and adults), the epithelial principal cells were devoid of these membrane systems, and exogenous peroxidase was not detected in the cytoplasm of the principal cells. The results suggest that at least the proximal portion of the large intestine in neonatal animals has the capacity to absorb macromolecular protein through those surface principal cells that have specialized intracellular membrane systems.

1721 LACK OF EFFECT OF VITAMIN D AND ITS METABOLITES ON INTESTINAL PHOSPHATE TRANSPORT IN FAMILIAL HYPOPHOSPHATEMIA OF MICE. (Eng.) O'Doherty, P. J. A.; DeLuca, H. F.; Eicher, E. M. (Coll. Agricultural and Life Sciences, Univ. Wisconsin, Madison, WI 53706). *Endocrinology* 101(4): 1325-1330; 1977.

Intestinal calcium and phosphate transport was studied in normal and hypophosphatemic mice fed vitamin D-deficient or -supplemented diets, or phosphorus-deficient or -supplemented diets. Regardless of dietary phosphorus levels (low phosphorus, 0.1% or normal phosphorus, 0.3%), the genetic hypophosphatemic mice had drastically reduced levels of serum inorganic phosphate and intestinal phosphate transport while showing only slightly reduced serum calcium and intestinal calcium transport levels. The inclusion of vitamin D (250 ng/day) in the diet did not increase the low serum phosphorus levels and low rates of intestinal phosphate transport in the genetic hypophosphatemic mice, while it did increase serum calcium and intestinal calcium transport levels. The administration of 1,25-dihydroxyvitamin D_3 to the hypophosphatemic mice stimulated intestinal calcium transport but had no effect on intestinal phosphate transport. In contrast, 1,25-dihydroxyvitamin D_3 stimulated both phosphate and calcium transport in the intestine of normal mice. The results support the hypothesis that the primary metabolic disturbance in familial hypophosphatemia involves a defect in phosphate transport mechanisms.

1722 MECHANISM OF INTESTINAL ABSORPTION OF THIAMINE. (Eng.) de Angelis, R. C. (Caixa Postal, 4365, 01000 Sao Paulo, Brazil). *Arq. Gastroenterol.* 14(3):135-143; 1977.

The mechanism of thiamine absorption from the intestinal lumen was studied in mice, hamsters, and rats. *In vitro* experiments were performed using the everted sac technique in the small intestine of mice and hamsters. *In vivo* perfusion of rat small intestine was performed in anesthetized animals. Glucose and the volume of extracellular compartments were also estimated. In *in vitro* studies, when thiamine concentrations in the incubation fluid were up to 0.2 µg/ml, its final concentration in the mucosa was higher than that in the incubation medium. At concentrations above 5 µl/ml, the accumulation of both thiamine and glucose in the mucosa was inhibited by 2-4-dinitrophenol (DNP) or sodium fluoride (NaF) in concentrations over 1×10^{-5} M. At low concentrations (0.05 µg/ml), thiamine entered the epithelial cells by means of active transport mechanism, and the presence of sodium was required. In the presence of metabolic inhibitors (DNP, NaF) or when sodium was replaced by lithium, thiamine passed into the mucosa by diffusion. At thiamine concentrations above 20 µg/ml, its transport was enhanced by DNP, NaF, or anoxia. The rate of transport was inversely related to differences of the potentials generated across the mucosal cells.

1723 EFFECT OF ETHANOL ON INTESTINAL (Na, K) ATPase AND INTESTINAL THIAMINE TRANSPORT IN RATS. (Eng.) Hoyumpa, A. M., Jr.; Nichols, S. G.; Wilson, F. A.; Schenker, S. (Veterans Admin. Hosp., Nashville, TN 37203). *J. Lab. Clin. Med.* 90(6):1086-1095; 1977.

Since previous studies suggested that ethanol may impair thiamine transport by inhibiting serosal (Na, K)-ATPase activity, the effect of ethanol on this enzyme was investigated. (Na, K) ATPase was assayed in the brush border membrane and basolateral membrane (BLM) fractions of rat intestinal mucosal cells. In the jejunum, BLM (Na, K)-ATPase activity was 13-fold greater than in the corresponding brush border preparation. Ethanol (0.5 M), added *in vitro* to the BLM preparation, reduced (Na, K)-ATPase activity in the jejunum to 41% ($p<0.001$) of control. *In vitro* ethanol (0.1 M, 0.2 M, 0.3 M, 0.5 M, 0.7 M, and 1.0 M) decreased jejunal BLM (Na, K)-ATPase activities to 94%, 78%, 58%, 41%, 28%, and 17% of control value (for all but 94%, $p<0.001$), resp. In addition, 1 hr after the p.o. administration of 50, 100, 250, 500, and 750 mg/100 g ethanol, ATPase activity declined to 73%, 52%, 52%, 62%, and 48% of control, resp. (for all, $p<0.01$). The same doses of ethanol decreased the serosal appearance rate of 0.5 µM thiamine to 82%, 48%, 50%, 51%, and 51% of control, resp. (for all but 82%, $p<0.05$). These data clearly show an association between ethanol inhibition of BLM (Na, K) ATPase and decreased thiamine transport, but whether this association is one of cause and effect requires further study.

1724 LIMITED FAT ABSORPTION IN THE LARGE INTESTINE OF MICE: A MORPHOLOGICAL STUDY. (Eng.) Snipes, R. L. (Zentrum fur Anatomie und Zytobiologie der Justus-Liebig-Universitat, Aulweg 123, D-6300 Giessen, W. Germany). *Acta Anat. (Basel)* 99(4):435-439; 1977.

Fat absorption and mucosal morphology were studied in the cecum and colon of mice after force-feeding fat and after the injection of predigested donor fat into ligated segments of the large intestine. Both the feeding of corn oil (0.5-1.0 ml for 3 hr at 3 times daily for 2-3 days) and the injection of fat led to the appearance of fat droplets in the epithelial cells of the large intestine; the number of fat droplets in these animals was significantly greater than that in controls. Electron microscopy revealed that large droplets were present in the supra- and infranuclear areas after the exposure to fat. Initial sequestration in the smooth endoplasmic reticulum was not apparent, as it is in the small intestine. After longer absorption times, fat was seen to accumulate in the large intestinal epithelial cells. The accumulation was mostly in the form of increasing droplet size. The observations suggest that the entry of fat into segments of the colon and cecum occurs by simple diffusion. The accumulation of large fat droplets indicates that the ability of the cells to process the fat efficiently for its transport out of the cells is reduced in comparison with that in the proximal small intestine.

1725 ROLE OF BILIARY LECITHIN IN LYMPHATIC TRANSPORT OF FAT. (Eng.) Tso, P.; Balint, J. A.; Simmonds, W. J. (Dept. Physiology, Univ. Western Australia, Nedlands 6009, Western Australia). *Gastroenterology* 73(6):1362-1367; 1977.

The role of luminal lecithin in the lymphatic transport of fat as chylomicrons was assessed in male Wistar rats. Two doses of fat (low and high) were fed to control and bile fistula rats. The infusion of a low dose of a mixture of oleic acid and monoolein (35 µmol/hr total fatty acid, molar ratio of 2:1, solubilized in 55 µmol of sodium taurocholate) produced no difference in the lymphatic output of absorbed fat during steady-state (7th and 8th hr) absorption. Infusing a high dose (173 µmol/hr) of a mixture of oleic acid and monoolein produced a lower triglyceride and phospholipid output in bile fistula rats with a higher proportion of oleic acid in lymph lecithin than in control rats. The alterations in bile fistula rats returned to normal following the addition of biliary lecithin (10 µmol/hr) to the infusate. It is concluded that intraluminal biliary lecithin plays a significant role in the translocation of high doses of absorbed fat into lymph and in the amount and type of lecithin synthesized.

1726 ABSORPTION OF PARTIALLY HYDROGENATED SOY OIL BY INFANTS. (Eng.) Klein, G. L.;

MacLean, W. C., Jr.; Lopez de Romana, G.; Massa, E.; Graham, G. G. (615 North Wolfe St., Baltimore, MD 21205). *Nutr. Rep. Int.* 16(4):447-553; 1977.

Apparent absorption of partially hydrogenated soy oil was compared with that of nonhydrogenated soy oil in two groups of infants: five previously malnourished boys, 7-22 months old, and six normal boys, 4-14 months old. Fecal fat excretion while consuming nonhydrogenated soy oil (7.2 ± 2.3 g/day, 14.4 ± 5.5% of intake) was not significantly greater than that while consuming partially hydrogenated soy oil (6.1 ± 2.3 g/day, 12.0 ± 4.6% of intake). Nitrogen balance was similar with both diets. There seems to be no contraindication to the use of the more stable partially hydrogenated form of the oil in formulas intended for infants over 4 months old; however, these studies do not include infants in the immediate neonatal period.

1727 PHARMACEUTICAL APPROACH TO THE ORAL DOSAGE FORM OF MACROMOLECULES: EFFECT OF BILE SALTS AND OIL-IN-WATER EMULSIONS ON THE INTESTINAL ABSORPTION OF UROGASTRONE IN THE RAT. (Eng.) Hori, R.; Okumura, K.; Inui, K. I.; Nakamura, N.; Miyoshi, A.; Suyama, T. (Hiroshima Univ. Sch. Medicine, Hiroshima, Japan). *Chem. Pharm. Bull. (Tokyo)* 25(8):1974-1979; 1977.

The absorption of urogastrone, a glycoprotein with gastric antisecretory activity, from the rat intestine was studied using a technique in which the indirect assay of its appearance in the blood stream was facilitated by a concomitant lowering of gastric acid secretion. The i.v. or i.p. administration of urogastrone (0.3-0.5 mg, i.v.; 1.3-2.5 mg, i.p.) produced 40% inhibition of control levels of H^+ output. The intrajejunal administration of urogastrone (15.0-20.0 mg) produced only a slight inhibitory response. However, when urogastrone was administered intrajejunally with various bile salts or oil-in-water emulsions, a strong inhibitory response of gastric H^+ secretion was elicited. Trioctanoin emulsion was the most effective, followed by olive oil, diethyl phthalate, and liquid paraffin, resp. The results suggest that orally active dosage forms for poorly absorbable macromolecules such as urogastrone might be prepared by pharmaceutical modification.

1728 EFFECTS OF CHOLERA ENTEROTOXIN ON INTESTINAL TISSUE WATER AS MEASURED BY NUCLEAR MAGNETIC RESONANCE (NMR) SPECTROSCOPY: II. (Eng.) Udall, J. N.; Alvarez, L. A.; Chang, D. C.; Soriano, H.; Nichols, B. L.; Hazlewood, C. F. (Baylor Coll. Medicine, Houston, TX 77030). *Physiol. Chem. Phys.* 9(1):13-20; 1977.

To determine the effects of cholera enterotoxin on intestinal tissue water, an open-ended loop experiment was performed in male rats. A double ligature was placed 20 cm proximal to the cecum, and 2-4 cm^3 of saline was injected distal to the ligature. A temporary ligature was placed proximal to the cecum, and 2.0 ml of enterotoxin was injected into the closed loop. A control was injected with 2.0 ml saline. In addition, the intestinal villi were scraped, centrifuged at 2,000 revolutions per min for 10 min, and the villous specimens were evaluated for water concentration and nuclear magnetic resonance (NMR) relaxation parameters. The average luminal fluid volume for the enterotoxin-exposed animal was 1.3 ml, compared to 0.3 ml for the control ($p<0.01$). Water percentage in intestinal tissue was 80.1 ± 0.5% for the toxin-exposed and 81.9 ± 0.3% for the control ($p<0.005$). In the scraped villi experiment, the percentage of water, corrected for fat, was 80.9 ± 0.1% in the control, and 86.9 ± 0.6% in the toxin-exposed animal ($p<0.01$). The NMR relaxation times of water protons were significantly lengthened in all toxin-exposed tissue. The results confirm the hypothesis that enterotoxin increases intestinal cell water content by acting on the mucosal cells.

1729 INTERRELATIONSHIP BETWEEN MUCOSAL CELL TRANSFERRIN AND IRON ABSORPTION [Abstract]. (Eng.) Savin, M. A.; Cook, J. D. (Univ. Kansas Medical Center, Kansas City, KN). *Clin. Res.* 25(4):573A; 1977.

1730 THE ABSORPTION OF THE KETO ACID ANALOGUE OF VALINE FROM RAT SMALL INTESTINE [Abstract]. (Eng.) Weber, F. L., Jr.; Deak, S. (Veterans Admin. Hosp., Lexington, KY). *Clin. Res.* 25(4):575A; 1977.

1731 CHOLESTEROL REDUCES THE EFFECTS OF OLEIC ACID ON JEJUNAL WATER AND SOLUTE TRANSPORT [Abstract]. (Eng.) Ammon, H. V.; Broor, S. L. (Veterans Admin. Center, Wood, WI). *Clin. Res.* 25(4):569A; 1977.

1732 INTESTINAL THIAMINE TRANSPORT: EFFECT OF CHRONIC ETHANOL ADMINISTRATION IN RATS [Abstract]. (Eng.) Hoyumpa, A.; Nichols, S.; Henderson, G.; Schenker, S. (Veterans Admin. Hosp., Nashville, TN). *Clin. Res.* 25(4):571A; 1977.

1733 ROLE OF MITOCHONDRIA IN IRON TRANSPORT BY GUINEA-PIG SMALL INTESTINE [Abstract]. (Eng.) Hopkins, J.; Cox, T. M.; Peters, T. J. (Royal Postgraduate Medical Sch., London, England). *Gut* 18(11):A961; 1977.

1734 IN VITRO UPTAKE OF IRON BY HUMAN DUODENAL BIOPSIES [Abstract]. (Eng.) Cox, T. M.; Peters, T. J. (Royal Postgraduate Medical Sch., London, England). *Gut* 18(11):A961; 1977.

1735 EFFECT OF MALTOSE ON THE ABSORPTION OF GLUCOSE IN THE JEJUNUM IN MAN [Abstract]. (Eng.) Sandle, G. I.; Lobley, R. W.; Holmes, R. (Manchester Royal Infirmary, Manchester, England). *Gut* 18(11):A944-A945; 1977.

ABSORPTION - EXCRETION - TRANSPORT

1736 THE ROLE OF GASTRIC LIPOLYSIS ON FAT ABSORPTION AND BILE ACID METABOLISM IN THE RAT [Abstract]. (Eng.) Roy, C. C.; Lefebvre, D.; Chartrand, L. (Hopital Ste-Justine, Montreal, Quebec, Canada). *Clin. Res.* 25(5):689A; 1977.

1737 PROPIONATE TRANSPORT BY THE HUMAN COLON [Abstract]. (Eng.) Ruppin, H.; Bar-Meir, S.; Soergel, K. H.; Wood, C.; Schmitt, M. G. (Medical Coll. Wisconsin, Milwaukee, WI). *Clin. Res.* 25(4):609A; 1977.

1738 EFFECTS OF VASOACTIVE INTESTINAL PEPTIDE (VIP) ON CANINE INTESTINAL Na AND H_2O FLUXES AND BLOOD FLOW [Abstract]. (Eng.) Mailman, D. (Dept. Biology, Univ. Houston, Houston, TX 77004). *Physiologist* 20(4):60; 1977.

1739 EFFECT OF ALDOSTERONE, VASOPRESSIN, AND NATRIURETIC FACTOR ON ABSORPTION IN THE RAT JEJUNUM. (Rus.) Kosuba, R. B.; Ivanov, Yu. I. (Chernovtsy Medical Inst., Chernovtsy, USSR). *Biull. Eksp. Biol. Med.* 83(6):704-706; 1977.

1740 ASCORBIC ACID ABSORPTION IN RAT INTESTINE AND KIDNEY. (Eng.) Davis, M. G.; Murphy, P. R.; Crawshaw, S. J.; MacGladrie, K. (Sch. Natural Sciences, Hatfield Polytechnic, Hatfield, Herts AL10 9AB, England). *Nutr. Metab.* 21(Suppl. 1):266-268; 1977.

1741 INTESTINAL TRANSPORT OF UREA IN NORMAL AND UREMIC RATS. (Spa.) Robles, G.; Suarez, G. I.; Chavez-Peon, F.; Wolpert, E. (Instituto Nacional de la Nutricion, Av. San Fernando y Viaducto Tlalpan, Mexico 22, D.F.). *Rev. Invest. Clin. (Mex.)* 29(2):151-159; 1977.

1742 HUMORAL REGULATION OF VITAMIN B_{12} ABSORPTION BY PREGNANT RAT SMALL INTESTINE [Abstract]. (Eng.) Robertson, J. A.; Gallagher, N. D. (Royal Prince Alfred Hosp., Sydney, Australia). *Clin. Exp. Pharmacol. Physiol.* 4(5):481; 1977.

1743 ACTION OF GASTROINTESTINAL HORMONES ON SODIUM TRANSPORT ACROSS SALIVARY DUCT EPITHELIUM [Abstract]. (Eng.) Denniss, A. R.; Young, J. A. (Dept. Physiology, Univ. Sydney, Sydney, Australia). *Clin. Exp. Pharmacol. Physiol.* 4(5):480; 1977.

See also, 1697, 2154, 2213, 2547, 2583, 2598.

MOTILITY

1744 MANOMETRIC STUDIES OF THE UPPER ESOPHAGEAL SPHINCTER. (Eng.) Berlin, B. P.; Tedesco, F.; Fierstein, J. T.; Ogura, J. H. (Washington Univ. Medical Sch., 517 S. Euclid, St. Louis, MO 63110). *Ann. Otol. Rhinol. Laryngol.* 86(5, Part 1):598-602; 1977.

A modification of a multiluminal catheter was used to study the pharyngoesophageal sphincter (PES) in 6 normal patients and in 13 patients who had undergone partial laryngeal surgery. Manometry is carried out with a six-lumen catheter where lateral orifices are spaced at 60-degree intervals around the circumference of the catheter at the same level. The backbone of this catheter is a length of polyvinyl tubing with an outside diameter of 6 mm. Six pieces of 1.5-mm tubing are fused around the internal circumference of the tube. Pressure profiles in the normal patients revealed a marked increase in intraluminal pressure in the anterior-posterior direction; this increase is explained by the anatomy of the cricopharyngeal muscle, which does not insert in a median raphe. These readings were reliable and reproducible. The operative patients included nine subtotal supraglottic laryngectomies and four partial laryngopharyngectomies. Eight patients had a cricopharyngeal myotomy and five did not. Pre- and postoperative measurements in this series revealed a marked decrease in PES pressure in those patients who had a myotomy; however, all patients were decannulated and swallowed postoperatively without clinical evidence of aspiration. All future manometric studies of the PES should employ a multilumined catheter so that the differential pressures in the upper esophagus are recorded.

1745 STATIC AND DYNAMIC CHARACTERISTICS OF FLUID-FILLED ESOPHAGEAL MANOMETRY SYSTEMS. (Eng.) Ask, P.; Oberg, P. A.; Tibbling, L. (Dept. Medical Engineering, Linkoping Univ., S-581 85 Linkoping, Sweden). *Am. J. Physiol.* 233(5):E389-E396; 1977.

Esophageal manometric systems with water-filled catheters were characterized using model experiments. The examined parameters were catheter dimension, catheter compliance, catheter resistance, pump type,

pump compliance, and perfusion flow. Accurate static pressure measurements were obtained for perfused systems independently of the parameters investigated. The dynamic characteristics varied with catheter diameter and perfusion flow. For catheters with low diameter, a narrow band width was obtained for the investigated perfusion flows. The results are expressed in terms of an electric model of the measurement system. Perfusion pumps with low compliance are recommended to improve the dynamic properties of the measurement system.

1746 ESOPHAGEAL MANOMETRY IN THE OPOSSUM. (Eng.) Schulze, K.; Dodds, W. J.; Christensen, J.; Wood, J. D. (Univ. Iowa Coll. Medicine, Iowa City, IA 52242). *Am. J. Physiol.* 233(3): E152-E159; 1977.

Esophageal manometry was carried out in normal opossums to provide basal data about normal esophageal motor functions *in vivo*. At rest, separate and distinct high pressure zones were recorded at the level of the lower esophageal sphincter, diaphragmatic hiatus, aortic arch, and upper esophageal sphincter. Each zone demonstrated a characteristic pattern of pressures in the radii of the coronal section and a characteristic response to swallowing. Pressures in the sphincters fell with swallowing. Peristalsis was not bolus-dependent and occurred with 98% of swallows. Pressures generated by peristalsis were greater in the middle of the esophagus than at the ends. Values for resting lower esophageal sphincter pressure and the characteristics of peristalsis were reproducible between different studies in the same animals.

1747 LOWER SPHINCTER OF THE OPOSSUM ESOPHAGUS IN PSEUDOPREGNANCY. (Eng.) Schulze, K.; Christensen, J. (Univ. Hosp., Iowa City, IA 52242). *Gastroenterology* 73(5):1082-1085; 1977.

The possible role of estrogen and progesterone in the development of changes in esophageal function during pregnancy was studied by producing hormone-induced pseudopregnancy in opossums. The animals received estradiol valerate (100 µg/day, i.m.) from day 1 to day 12 and medroxyprogesterone acetate (15 mg) from day 7 to day 12. Controls received no injections. Both groups underwent manometry on days 1, 7, and 12. Lower esophageal sphincter pressure decreased ($p<0.05$) in treated animals from 58 ± 13 mm Hg and 57 ± 11 on days 1 and 7, resp., to 44 ± 10 mm Hg on day 12. The lower esophageal sphincter pressure remained unchanged in controls. In both groups, there was no change in peristaltic wave pressure, duration, or velocity in the distal 6 cm of the esophagus. No abnormal peristaltic phenomena were observed. Esophageal muscle strips prepared from treated animals showed responses to electrical field stimulation of intrinsic nerves that were like those from control animals. The same was true for responses to acetylcholine and pentagastrin. Total tissue water and total tissue potassium content did not differ in treated and control animals. The fact that the lower esophageal sphincter is situated well below the diaphragmatic hiatus in the opossum, making the pressures produced by these two structures clearly differentiated on manometry, indicates that the effect of estradiol and progesterone on the lower esophageal sphincter pressure is not attributable to changes at the diaphragmatic hiatus.

1748 LOWER-ESOPHAGEAL SPHINCTER FUNCTION DOES NOT DETERMINE RESTING UPPER-ESOPHAGEAL SPHINCTER PRESSURE. (Eng.) Berte, L. E.; Winans, C. S. (Univ. Chicago Pritzker Sch. Medicine, Chicago, IL). *Am. J. Dig. Dis.* 22(10):877-880; 1977.

Records of 269 esophageal motility studies of patients without prior gastroesophageal surgery, achalasia, scleroderma, gastroesophageal malignancy, or peptic esophageal strictures were reviewed to determine the relationship between lower esophageal sphincter (LES) function and upper esophageal sphincter (UES) pressure. Average and greatest UES pressures were similar in patients with LES pressures less than 10 mm Hg or greater than 20 mm Hg, and in patients with and without gastroesophageal reflux as determined by an intraesophageal pH electrode test. The belief that patients with weak lower esophageal sphincters and gastroesophageal reflux have stronger upper esophageal sphincters to guard against pharyngeal reflux and aspiration cannot be confirmed by current manometric techniques.

1749 MYOGENIC AND NEURAL CONTROL SYSTEMS FOR ESOPHAGEAL MOTILITY. (Eng.) Sarna, S. K.; Daniel, E. E.; Waterfall, W. E. (McMaster Univ. Medical Center, 4W8, 1200 Main St. West, Hamilton, Ontario L8S 4J9, Canada). *Gastroenterology* 73(6): 1345-1352; 1977.

The role of myogenic and neural control systems in esophageal motility was studied in anesthetized opossums by applying electrical pulses at 20 to 40 V and 100- to 400-msec pulse width directly to muscle layers, by cervical vagal stimulation (10-25 pulses/sec, 0.5- to 5-msec pulse width, 10-40 V), and by balloon distention. Direct muscle stimulation resulted in a propagated contraction in 13 of 22 opossums (proximal propagation from a distal stimulation site and vice versa). The velocity of propagation was of the same order of magnitude as that of a spontaneous swallow (<5 cm/sec). The propagated contractions were not blocked by i.v. or close intra-arterial (i.a.) atropine (100-500 µg/kg, i.v.; 100-400 µg/kg, i.a.), hexamethonium (5-10 mg/kg, i.v.; 10 mg, i.a.), or by intra-arterial tetrodotoxin (20 µg). Smooth muscle depolarization by i.a. 40 mM KCl or tetraethylammonium (10 mg) brought about propagated contractions in those opossums that did not show this in the first place. Generally, these propagated contractions could also be initiated in these opossums by applying 2 to 3 stimulating pulses 1 to 1.5 sec apart. The propagated contractions in response to direct muscle stimulation were observed in all opossums 2 to 20 min after death. Cessation of vagal stimulation and

balloon relaxation produced "off-responses" that were blocked by tetrodotoxin. The propagation of off-responses was much faster than the swallow-induced peristaltic contractions. The myogenic control system in the esophagus is capable of producing propagated contractions independently, which resemble normal esophageal peristalsis in propagation velocity and may be the underlying system responsible for it. This system may, however, be modulated by the extrinsic and intrinsic nerves.

1750 AGE-RELATED CHANGES IN FORCE, STRESS, AND PRESSURE OF LOWER ESOPHAGEAL SPHINCTER OF THE RAT. (Eng.) Biancani, P.; Behar, J.; Zabinski, M. P. (Dept. Internal Medicine, Yale Univ., New Haven, CT 06510). *Am. J. Physiol.* 233(5):E407-E415; 1977.

Age-related changes in the mechanical characteristics and changes in the dimensions of the lower esophageal sphincter (LES) were investigated in Sprague-Dawley rats. Transversely cut lower esophageal sphincter rings of 3-week-, 6-week-, 3-month-, and 1-yr-old rats were studied *in vitro* at 80 cycles/sec stimulation (50 mA, 2 msec). *In vivo* length (circumference) and thickness of the circular muscle layer was found to increase with age. The length at which the muscle exerted maximum active force during electrical stimulation occurred for all age groups at approximately three times the *in vivo* length. When compared with adjacent sections, the sphincter exerted the highest active force and stress, both at the *in vivo* length and at the length of maximum active force. A large increase in the active force was observed in rats between 3 and 6 weeks, followed by a small decrease in the 1-yr-old rats. The active stress remained nearly constant between the ages of 3 weeks and 3 months and decreased thereafter. The large increase in active force observed between 3 and 6 weeks was caused by a slight increase in muscle contractility as well as by a more than threefold increase in the amount of circular muscle present. In rats older than 6 weeks, however, the active contractile force fell slightly, in spite of increased muscle mass, due to a substantial decrease in muscle contractility. Pressure-diameter relationships calculated from the *in vitro* force-length data and compared with previously determined *in vivo* pressure-diameter data, demonstrate good correlation between the *in vivo* and *in vitro* data.

1751 EFFECT OF CIGARETTE SMOKING ON THE LOWER OESOPHAGEAL SPHINCTER: ASSESSMENT OF NORMAL AND SYMPTOMATIC PATIENTS USING THE RAPID PULL-THROUGH TECHNIQUE OF OESOPHAGEAL MANOMETRY. (Eng.) Chattopadhyay, D. K.; Greaney, M. G.; Irvin, T. T. (Royal Infirmary, Sheffield, England). *Gut* 18(10): 833-835; 1977.

A rapid pull-through technique of manometry was used to determine the effect of cigarette smoking on lower esophageal sphincter pressure (LESP) in 10 asymptomatic volunteers and in 10 patients with gastroesophageal reflux. Basal LESP measurements in the two groups were not significantly different, but LESP was reduced by 19% in asymptomatic subjects ($p<0.01$) and by 21% in symptomatic patients ($p<0.02$) during cigarette smoking. The results suggest that smoking should be avoided in the clinical management of gastroesophageal reflux.

1752 INTESTINAL MYOELECTRIC ACTIVITY AFTER ACTIVATION OF CENTRAL EMETIC MECHANISM. (Eng.) Stewart, J. J.; Burks, T. F.; Weisbrodt, N. W. (Texas Medical Center, Houston, TX 77030). *Am. J. Physiol.* 233(3):E131-E137; 1977.

Changes in intestinal myoelectric activity after the intraventricular or peripheral injection of emetic drugs were studied in cats. Morphine (200 µg), apomorphine (200 µg), or epinephrine (150 µg) were injected either into a lateral cerebral ventricle or i.p. in cats implanted with monopolar, extracellular electrodes along the entire small intestine. Intraventricular injection of the agents produced emesis in a number of animals tested (4/10, 4/11, and 8/11 with morphine, apomorphine, and epinephrine, resp.). Each episode of retching and vomiting was preceded by a characteristic intestinal myoelectric pattern that consisted of the following: a dampening in slow-wave amplitude, followed by an intense burst of spike potentials that lasted several seconds. The pattern was recorded first in the distal small intestine, then migrated orad at a velocity of 2-3 cm/sec. After emesis, slow-wave frequency was reduced at recording sites along the entire small intestine. Atropine (100 µg/kg, i.p.) did not affect the emetic potency of epinephrine but abolished both the orally migrating spike-burst complex and the reduction in slow-wave frequency associated with vomiting. Naloxone (200 µg, intraventricularly) abolished morphine- and apomorphine-induced emesis without affecting the emetic potency of epinephrine; phentolamine (200 µg, intraventricularly) antagonized the emetic action of epinephrine without diminishing the emetic potency of morphine. No emesis, intestinal spike-burst complex, or changes in slow-wave frequency occurred after the i.p. administration of the emetic agents at the same doses effective centrally. Activation of the central emetic mechanism is associated with a myoelectric pattern recorded from the small intestine indicative of a reverse peristaltic wave.

1753 MIGRATING MYOELECTRICAL COMPLEX OF THE SMALL INTESTINE: AN INTRINSIC ACTIVITY MEDIATED BY THE VAGUS. (Eng.) Ruckebusch, Y.; Bueno, L. (Ecole Nationale Veterinaire, 31076 Toulouse Cedex, France). *Gastroenterology* 73(6):1309-1314; 1977.

The relative influence of neural versus hormonal components on the migrating myoelectrical complex (MMC) pattern and its disruption by feeding was studied in dogs. In healthy, conscious parenterally fed dogs and in sheep fed their usual diet, the MMC comprised two distinct phases termed irregular and regular spiking activity and was followed by a period of quiescence. The pattern persisted after bilateral transthoracic vagotomy and in animals with

alloxan-induced diabetes. In dogs, feeding disrupted the MMC pattern by obliterating the phases of regular spiking activity and quiescence for 6 to 12 hr, depending upon the amount of dry matter intake. After vagotomy, a latency in the disruption of the migrating myoelectrical complex pattern with feeding occurred and in vagotomized, diabetic dogs, the duration of disruption was strongly reduced. In sheep, the duration of irregular spiking activity of a jejunal segment increased or decreased corresponding to the bulk of digesta, a phenomenon damped after vagotomy. The results indicate that the role of the vagus is limited to (a) prompting prandial disruption, which is then maintained by hormonal effect; and (b) regulating the irregular spiking activity duration in relation to the bulk of digesta.

1754 THE GASTROINTESTINAL MYOELECTRIC RESPONSE TO 13-Nle-MOTILIN INFUSION DURING INTERDIGESTIVE AND DIGESTIVE STATES IN THE CONSCIOUS DOG. (Eng.) Wingate, D. L.; Ruppin, H.; Thompson, H. H.; Green, W. E. R.; Domschke, W.; Wunsch, E.; *et al.* (London Hosp. Medical Coll., Whitechapel, London E1 1BB, England). *Acta Hepatogastroenterol.* 24(4):278-287; 1977.

To determine whether 13-norleucine motilin (13-nle-motilin) enhances small intestinal electrical spike activity in conscious dogs under physiological conditions, as it does in the isolated preparation, intestinal myoelectric activity was studied in three fasted dogs with electrodes surgically implanted in the stomach and small intestine, during separate and combined i.v. infusions of 13-nle-motilin and pentagastrin (PG). Basal recordings confirmed the presence of regular interdigestive myoelectric complexes (MCs). In doses under 50 ng/kg/hr, 13-nle-motilin was without effect; higher doses (up to 400 ng/kg/hr) resulted in the interpolation of one or more MCs in the spontaneous sequence. The rate of aboral transit of 13-nle-motilin-induced MCs did not differ significantly from that of spontaneous MCs. When MCs were abolished by feeding or PG infusion, simultaneous 13-nle-motilin administration was without effect on spike activity, but slightly attenuated the accelerating effect of gastrin on the gastric pacemaker frequency. The myoelectric events triggered by 13-nle-motilin suggest that in the conscious dog the polypeptide may not act directly on the smooth muscle cell, as it does *in vitro*, but through an extra-enteric neural control mechanism that is uncoupled by gastrin.

1755 THE CONTRIBUTION OF PROSTAGLANDINS IN THE MUSCLE OF HUMAN ISOLATED SMALL INTESTINE TO NEUROGENIC RESPONSES. (Eng.) Bennett, A.; Stockley, H. L. (King's Coll. Hosp. Medical Sch., Denmark Hill, London SE5 8RX, England). *Br. J. Pharmacol.* 61(4):573-578; 1977.

The contribution of prostaglandins to neurogenic responses in the longitudinal and circular muscle was studied in the human ileum. In strips cut parallel to the longitudinal or circular muscle, indomethacin (2-10 μg/ml) usually lowered the tone, thus probably accounting for the reduction of nerve-mediated relaxations to electrical field stimulation. In longitudinal muscle strips, indomethacin enhanced contractions that occurred during electrical stimulation, probably because tone fell, but antagonized after-contractions. In the circular muscle, indomethacin reduced initial contractions but enhanced after-contractions. Prostaglandin E_2 (100 ng/ml) counteracted all of the effects of indomethacin in the longitudinal muscle and most of those in the circular muscle; prostaglandin F_{2_α} (100 ng/ml) restored circular muscle tone. The results suggest that prostaglandins affect the muscle directly and contribute to the regulation of tone. They may also mediate noncholinergic contraction in longitudinal muscle and suppress contractility in the circular muscle.

1756 CORRELATION OF VARIATIONS IN INTRALUMINAL PRESSURE AND POTENTIAL DIFFERENCES IN THE PERFUSED COLON. (Eng.) Postaire, J. G.; Gerard, J.; Devroede, G.; Van Houtte, N. V. (Departement du Genie Electrique, Universite de Sherbrooke, Sherbrooke, Quebec, Canada). *Gut* 18(10):771-778; 1977.

To investigate the nature of variations in the large intestinal potential differences, a continuous perfusion of isotonic saline was carried out in the colon of 14 rats. Intraluminal pressure and potential differences between the lumen and the peritoneal cavity were continuously and simultaneously recorded, while impedance of the system and respiration were also constantly monitored. To obtain a quantitative evaluation of the data, Fast Fourier Transform was performed on the signals and their derivatives, which were auto- and cross-correlated. While there was no obvious relation between pressure and potential in the unperfused colon, there was clear visual qualitative evidence that, during steady-state conditions of perfusion, an increase in intraluminal pressure was accompanied by a decrease in potential differences, while impedance of the recording system remained unchanged. Computer analysis disclosed four narrow ranges of stable frequencies for both pressure and potential. They were centered around 0.3, 1.75, 10.7, and 75 cycles/min, the latter being synchronous with respiration. It is concluded that the variations of potential differences recorded during perfusion are not electrical artifacts; the fast rhythm is probably induced by respiration, which increases intracolonic pressure and that, in turn, reduces the absolute value of potential differences, which remain negative mucosa *versus* serosa. The slower rhythms are synchronous for pressure and potential.

1757 HUMAN COLONIC MYOELECTRIC ACTIVITY IN RESPONSE TO PROSTIGMIN AND THE GASTROINTESTINAL HORMONES. (Eng.) Snape, W. J., Jr.; Carlson, G. M.; Cohen, S. (Hosp. Univ. Pennsylvania, 3400 Spruce St., Philadelphia, PA 19104). *Am. J. Dig. Dis.* 22(10):881-887; 1977.

Colonic myoelectric activity was determined using a mucosal clip electrode in 12 normal subjects and in cats, both in the basal state and following the administration of prostigmin, pentagastrin, cholecystokinin, or secretin. Slow-wave activity was present 49 ± 3.0% of the recording time in man and occurred at two frequencies, 6.5 ± 0.1 cycles/min and 3.5 ± 0.1 cycles/min, in the rectum. Spike potentials were infrequent in the basal state. Prostigmin (1.0 mg, i.m.), pentagastrin (0.5 µg/kg, i.v.), or cholecystokinin (1.0 U/kg) did not affect the slow-wave activity or frequency, but these agents significantly increased the number of spike potentials ($p<0.05$). Secretin had no effect on myoelectric activity. The electrode system was tested in the cat and showed excellent correlation of the myoelectric activity between the mucosal clip electrode and a serosal electrode. These studies indicate that a mucosal clip electrode provides an accurate method of recording colonic myoelectric activity when compared to a serosal electrode in the cat. In man, slow-wave activity is present only intermittently and exists at two frequencies. Gastrointestinal hormones and prostigmin increase spike potential discharge without altering slow-wave activity or frequency.

1758 EFFECT OF CAPSAICIN ON ELECTRICAL SLOW WAVES IN THE ISOLATED CAT COLON. (Eng.) Anuras, S.; Christensen, J.; Templeman, D. (Dept. Internal Medicine, Univ. Iowa, Iowa City, IA 52242). *Gut* 18(8):666-669; 1977.

To determine whether the laxative effect of capsaicin involves an alteration of electrical slow waves of the colon, the effect of that agent on the electromyogram of the isolated cat colon was examined. At a concentration of 10^{-4} M, it caused a significant reduction in the frequency of the electrical slow waves in the proximal half of the colon. The frequency fell to its lowest value, 45% of control ($p<0.001$), in the most proximal 10% of the organ below the ileocecal junction, and the effect progressively diminished along the colon. In the distal half of the colon, the change in frequency was not significant. Sectioning of the colon into segments reduced the frequency of the slow waves in the proximal half of the colon, and capsaicin further reduced the frequency in the segments representing the proximal 30% of the colon. The results suggest that the capsaicin effect is an uncoupling of slow wave oscillators.

1759 EFFECTS OF GLUCAGON AND SECRETIN ON FOOD- OR MORPHINE-INDUCED MOTOR ACTIVITY OF THE DISTAL COLON, RECTUM, AND ANAL SPHINCTER. (Eng.) Chowdhury, A. R.; Lorber, S. H. (777 Court St., Reading, PA 19601). *Am. J. Dig. Dis.* 22(9):775-780; 1977.

The effects of glucagon and secretin on food- or morphine-induced motor activity of the distal colon, rectum, and internal anal sphincter were investigated in 12 healthy subjects. Intraluminal pressure changes were measured using a triple-lumen polyvinyl tube assembly with three side orifices. Glucagon (3 µg/kg over 30 sec, followed by a continuous infusion of 30 µg/kg/hr, i.v.) caused significant inhibition of food- or morphine (0.1 mg/kg, i.v.)-induced motor activity of both the distal colon and rectum. In contrast, secretin (0.5 U/kg over 30 sec, followed by 2 U/kg/hr, i.v.) did not suppress morphine-induced motor activity but did significantly inhibit food-stimulated motor activity of the distal colon. The inhibitory effect of secretin on motor activity of the rectum was insignificant. Morphine, but not food, elevated the pressure of the anal sphincter, which was not affected by glucagon or secretin. Hyperglycemia, produced by the infusion of 5% glucose, had no effect on motor activity. These studies demonstrate that glucagon but not secretin, in the doses employed, inhibits morphine-induced motor wave activity of both the distal colon and rectum and that this inhibitory effect is not secondary to hyperglycemia. Furthermore, the rise in anal sphincter pressure is not affected by glucagon or secretin.

1760 STUDY OF GASTRIC EMPTYING USING A FERROMAGNETIC TRACER. (Eng.) Benmair, Y.; Dreyfuss, F.; Fischel, B.; Frei, E. H.; Gilat, T. (Weizmann Inst. Science, Rehovot, Israel). *Gastroenterology* 73(5):1041-1045; 1977.

A new ferromagnetic method for the measurement of gastric emptying is described, and the results of gastric emptying studies in 61 subjects with normal gastric motility are presented. An inert tracer, magnesium ferrite, is added to a test meal. Its amount in the stomach is then measured at regular intervals by an external transducer using its ferromagnetic properties. The method is noninvasive and devoid of radiation exposure. The magnetic fields used are harmless. The shape of the gastric emptying curve obtained in the 61 subjects conformed best to an exponential function. The mean half-time of gastric emptying was 49 ± 17.4 min. In this limited series, age and sex did not affect gastric emptying. In 14 of 15 cases, there was a good correlation between the results of this method in determining the end point of gastric emptying and those of an x-ray method. This ferromagnetic method appears to be uncomplicated, inexpensive, reliable, and reproducible.

1761 CANINE GASTRIC EMPTYING OF SOLIDS AND LIQUIDS. (Eng.) Hinder, R. A.; Kelley, K. A. (Mayo Medical Sch., Rochester, MN 55901). *Am. J. Physiol.* 233(4):E335-E340; 1977.

To test the hypothesis that liquids are emptied from the stomach, whereas solids are retained for reduction to a size suitable for passage into the duodenum, gastric emptying of labeled solids and a liquid was simultaneously assessed by quantitating the rate of appearance of the gastric markers in the duodenum. Four dogs received a digestible solid (50 g of liver tagged with [^{57}Co]cyanocobalamine and diced into 1-cm cubes), an indigestible solid (40 radiopaque plastic spheres, diameter 7

mm), and a liquid (400 ml of either 1% or 10% dextrose tagged with polyethylene-[1,2-^{3}H]glycol). The rate of gastric emptying of cubed liver was similar whether the liver was given alone or with solutions of the rapidly emptying 1% dextrose, but its rate of emptying was slowed by the slower emptying 10% dextrose. Homogenization of the liver speeded its emptying. Moreover, the homogenized liver emptied even faster when dispersed in 1% dextrose and emptied more slowly when dispersed in 10% dextrose, but in both instances the liver emptied at the same rate as the solution with which it was mixed. Indigestible spheres were nearly all retained, whereas the liver and the dextrose were emptied. It appears that the stomach empties liquids and retains solids for reduction to a smaller size, after which they are discharged at the same rate as the liquid then present in the stomach.

1762 GASTRIC EMPTYING OF WHOLEMEAL AND WHITE BREAD. (Eng.) Grimes, D. S.; Goddard, J. (Withington Hosp., Manchester M20 8LR, England). *Gut* 18(9):725-729; 1977.

The rates at which solid and liquid leave the stomach after meals of whole-meal and white bread were studied in 11 normal subjects (9 men, 2 women) and in rats, using a double isotope technique. There was no difference in the rates at which the solid phases of the gastric contents left the stomach, but liquid left the stomach significantly more rapidly with white bread than with whole-meal bread ($p<0.005$). Furthermore, the amount of liquid leaving the stomach unaccompanied and therefore unbuffered by solid was significantly greater after white bread than whole-meal bread. These findings may be of significance in the pathogenesis of duodenal ulcer, and it is suggested that the substitution of whole-meal bread for white bread might be of benefit to patients with duodenal ulcer and nonulcer dyspepsia.

1763 MYOELECTRICAL AND MECHANICAL ACTIVITY DURING THE EMPTYING OF LIQUID TEST MEALS FROM THE ISOLATED CANINE STOMACH. (Eng.) Kowalewski, K.; Kolodej, A. (Surgical-Medical Res. Inst., Univ. Alberta, T6G 2N8 Edmonton, Alberta, Canada). *Rend. Gastroenterol.* 9(2):122-126; 1977.

The effect of liquid meals on gastric emptying, antral electrical activity, and antral mechanical activity was studied in 14 isolated canine stomachs, perfused *ex vivo* with homologous blood. The following liquid meals were used: normal saline, 50 mM HCl, 30% glucose, 80 mM sodium oleate, and 15% liver extract. The emptying of acid meal and of liver extract was slower than the emptying of the other meals. The frequency of electrical control activity (ECA) was significantly decreased after the acid meal (4.6 ± 0.4 ECA/min) and increased after liver extract (6.0 ± 0.2 ECA/min), as compared with the effect of other meals on ECA. The force and frequency of antral contractions increased after the liver extract meal, and was low after the acid meal, confirming the results of previous *in vivo* studies on humans and dogs.

1764 EFFECTS OF GASTROINTESTINAL HORMONES ON THE ELECTRICAL AND MECHANICAL ACTIVITY OF THE CAT STOMACH. (Eng.) Ohkawa, H.; Watanabe, M. (Yamaguchi Univ. Sch. Medicine, Ube 755, Japan). *Tohoku J. Exp. Med.* 122(3):287-298; 1977.

The effects of gastrointestinal hormones on electrical and mechanical activity of smooth muscle of the cat stomach were studied. Spontaneous electrical activity of antrum preparations consisted of slow waves with superimposed spike-like potentials. Phasic contractions occurred synchronously with the electrical activity. Pentagastrin (1.25×10^{-7}-2.5×10^{-7} g/ml), tetragastrin (1.25×10^{-7} g/ml), pancreozymin (0.05-0.1 U/ml), and secretin (0.05-0.25 U/ml) increased the frequency of slow wave component and the amplitude of phasic contraction. Atropine (2.5×10^{-6} g/ml) and tetrodotoxin (1.6×10^{-7} g/ml) did not block the spike-like potential and slow wave component. Norepinephrine (5×10^{-6} g/ml) and verapamil (3×10^{-6}-1×10^{-5} g/ml) blocked the phasic contraction. The excitatory effects of these gastrointestinal hormones were observed in the presence of atropine, tetrodotoxin, and dibenamine, but not with verapamil. When the mechanical activity of the antral strips was depressed by caffeine or theophylline, the excitatory effects of gastrointestinal hormones were also suppressed. The excitatory effects produced by these hormones were potentiated by imidazole. These results suggest that gastrointestinal hormones have a direct excitatory action on the longitudinal smooth muscle of the antrum and that the excitatory action is associated with phosphodiesterase activity and intracellular cyclic AMP content.

1765 EFFECT OF SYNTHETIC MOTILIN ON GASTRIC MOTOR ACTIVITY IN CONSCIOUS DOGS. (Eng.) Itoh, Z.; Takeuchi, S.; Aizawa, I.; Takayanagi, R. (Gunma Univ. Sch. Medicine, Maebashi 371, Japan). *Am. J. Dig. Dis.* 22(9):813-819; 1977.

The effect of the i.v. infusion of synthetic motilin on gastric motor activity was investigated by means of chronically implanted force transducers in four conscious dogs. Since the gastric motor pattern was found to consist of two major subpatterns during a 24-hr period, i.e., digestive and interdigestive motor activity, motilin was tested for its motor stimulating activity in both states. The digestive pattern was characterized by steady, low-amplitude antral contraction, while the interdigestive pattern consisted of a series of high-amplitude contractions in both the gastric body and antrum, with intervening and long-lasting motor quiescence. Motilin had no influence upon gastric motor activity in the digestive state. However, during the interdigestive state, motilin (0.3-2.7 µg/kg/hr) induced motor activity similar to the naturally-occurring interdigestive contractions in a dose-related fashion. Since motilin is released by duodenal

alkalinization in the dog, it is postulated that motilin is a substance to control the interdigestive contractions in the dog, although other reports describe motilin release by duodenal acidification and inhibition of gastric emptying in man. Endogenous stimuli leading to motilin release may be different among species. This study indicates that motilin induces a contractile pattern similar to that seen during the interdigestive state in conscious dogs.

1766 MOTILIN ENHANCES GASTRIC EMPTYING OF LIQUIDS IN DOGS. (Eng.) Debas, H. T.; Yamagishi, T.; Dryburgh, J. R. (Dept. Surgery, Univ. British Columbia, 700 W. 10th Ave., Vancouver, British Columbia V5Z 1L5, Canada). *Gastroenterology* 73(4, Part 1):777-780; 1977.

The effect of natural motilin on gastric emptying of liquids was studied in dogs before and after either truncal vagotomy or antrectomy or both. The rate of gastric emptying was determined in six dogs with gastric fistulae by measuring the volume of fluid remaining in the stomach 10 min after instillation of 300 ml of 0.15 M NaCl containing phenol red (60 mg/l) as marker. The rate of emptying was determined with the dogs receiving only saline (controls) and while different doses of motilin were infused i.v. The rate of emptying of a solid meal was studied by measuring the amount of solid material (weight after desiccation) left in the stomach 15, 30, 60, 90, and 120 min after a meal of proprietary dog food equivalent in dry weight to 3 g/kg of body weight. Motilin was found to be a potent accelerator of gastric emptying of liquids but not of solids. The antrum was not needed for this action. Vagotomy shifted the dose-response curve to the right, increasing the half-dose 10-fold. These findings suggest that motilin acts on the proximal stomach to enhance emptying and that its potency depends on the presence of vagal tone. They also support the hypothesis that the proximal stomach mainly controls the emptying of liquids.

1767 EFFECTS OF VAGOTOMY ON THE ULTRASTRUCTURE OF THE NERVES OF DOG STOMACH. (Eng.) Oki, M.; Daniel, E. E. (McMaster Univ. Medical Center, Hamilton, Ontario L8S 4J9, Canada). *Gastroenterology* 73(5):1029-1040; 1977.

The effects of vagotomy on the gastric neuronal apparatus were studied ultrastructurally in five female dogs. A portion of the presynaptic terminals on neurons of the Auerbach's and Meissner's plexuses degenerated. The residual terminals presumably arose from intrinsic neurons. The neurons were of several types: (a) large motor neurons with synaptic connections that could not be distinguished from one another morphologically as to excitatory or inhibitory function and that underwent postdenervation changes and (b) presumed sensory neurons without detectable synaptic connections, which were unaffected by vagotomy, and which could be subdivided into two types. Other neuronal profiles with many large vesicles were observed only after vagotomy. The nerves to muscle layers contained small agranular vesicles and large dense-cored vesicles, sometimes with a predominance of one vesicle type or the other. It was not possible to determine whether these represented two morphological nerve types or sampling variations from a single structural type. Neither vesicle type seemed to be selectively affected by vagotomy. A few axons, presumably adrenergic, with small agranular vesicles, were observed, chiefly near blood vessels but also a few in the plexuses and in the muscle layers of the pyloric region. They were not obviously affected by vagotomy.

1768 THE INITIAL PHASE OF GASTRIC EMPTYING BEFORE AND AFTER VAGOTOMY AND PYLOROPLASTY. (Eng.) Sheiner, H. J.; Thompson, I. J.; Hamilton, S. G. L.; Quinlan, M. F. (Perth Medical Center, Nedlands, Western Australia 6009, Australia). *Aust. N.Z. J. Surg.* 47(3):419-423; 1977.

The initial phase of gastric emptying of solid food was monitored in 10 normal subjects and in 12 patients who had undergone truncal vagotomy and pyloroplasty for duodenal ulcer at least 12 months previously. A gamma camera and on-line computer facilities were used for monitoring. In normal subjects, a consistent pattern was seen comprising an early delay in the onset of emptying (plateau), followed by an exponential decay curve. After vagotomy, the plateau was lost, and the exponential pattern of emptying began once the stomach was full. There was no evidence of sudden "dumping" of contents from the stomach. The overall rates of emptying as measured by the half-emptying time were the same in normal and postvagotomy patients. The faster initial phase of emptying after vagotomy is probably due to a loss of the normal plateau rather than to a sudden precipitous dumping of food out of the stomach.

1769 GASTRIC EMPTYING IN THE RAT IS INHIBITED BY THE DUODENAL ULCEROGENS, CYSTEAMINE AND PROPIONITRILE. (Eng.) Lichtenberger, L. M.; Szabo, S.; Reynolds, E. S. (Univ. Texas Medical Sch. at Houston, 6400 W. Cullen, Houston, TX 77030). *Gastroenterology* 73(5):1072-1076; 1977.

The effect of cysteamine (28 mg/100 g, intragastrically) or propionitrile (6 mg/100 g, s.c.) on gastric emptying was investigated by measuring the disappearance of intragastrically administered [^{57}Co]-vitamin B_{12} from the stomach of rats pretreated with these drugs or with water (controls). When either of the test compounds was administered 4 hr before the indicator, the gastric emptying rate was markedly retarded; the calculated half-time of removal of the [^{57}Co]vitamin B_{12} was 12 min, 56 min, and 104 min in rats given water, cysteamine, and propionitrile, resp. Gastric emptying was still significantly retarded 24 hr after the administration of cysteamine. The maximum effect of cysteamine, however, occurred 30 min after drug administration. Subsequent studies

demonstrated that pyloroplasty was ineffective, whereas vagotomy completely blocked cysteamine-induced gastric retention. The duodenal ulcerogens therefore, may act like other factors that retard gastric emptying by acting on a vagally-dependent property of the proximal stomach to accommodate increasing volumes of liquid. These results suggest the possibility that this action of cysteamine and propionitrile to delay gastric emptying may be required for experimental ulcer formation.

1770 A MODEL FOR TREATING POST-IRRADIATION NAUSEA AND VOMITING IN MAN: THE ACTION OF INSULIN IN ABOLISHING RADIATION-INDUCED DELAY IN GASTRIC EMPTYING IN THE RAT. (Eng.) Hulse, E. V.; Patrick, G. (M.R.C. Radiobiology Unit, Harwell, Didcot, Oxon OX11 ORD, England). *Br. J. Radiol.* 50(597):645-651; 1977.

Radiation-induced delay of gastric emptying in rats, which may be comparable to radiation-induced nausea and vomiting in man, was successfully treated with insulin. After 200 R of whole-body x-ray exposure, the stomach of rats rarely showed any evidence of emptying over a 7-hr observation period. When a dose of 1.0 U of soluble insulin was given s.c. immediately after the first post-irradiation radiograph, the stomach began to empty immediately and continued to empty much faster than in unirradiated controls. Biphasic insulin, given immediately after the first post-irradiation radiograph, overcame radiation-induced gastric delay, but was without the precipitate emptying characteristic of soluble insulin. After 200 R of whole-body x-ray exposure, a dose of 0.5 U of biphasic insulin resulted in a stomach emptying rate that was virtually the same as that of unirradiated controls; with larger biphasic insulin doses, the stomach emptying rate was faster than in controls, and with smaller doses, the effect was proportionally reduced. Patterns of response to biphasic insulin were similar with larger radiation doses; an insulin dose of 1.0 U was required to restore normal gastric emptying after 600 R of x-rays, and a dose of 2.5 U was needed after 1,000 R of x-ray exposure. There was no simple correlation between the hypoglycemic action of insulin and its effect on stomach emptying. For example, in rats fed a barium meal containing malted milk and exposed to 200 R of x-rays, 0.1 U of insulin partially restored gastric emptying, but did not lower the plasma glucose level. Additional work is required to determine whether enteroglucagon or other intestinal hormones are involved in the actions of radiation and insulin on gastric motility. It is suggested that the use of insulin to treat radiation-induced nausea and vomiting in humans should be considered.

1771 MODIFYING EFFECT OF BRADYKININ ON MOTOR ACTIVITY IN THE GUINEA-PIG GALL BLADDER. (Eng.) Stasiewicz, J.; Szalaj, W.; Gabryelewicz, A. (Gastroenterology Clinic, Str. M.C. Sklodowskiej 24a, 15-276 Bialystok, Poland). *Clin. Exp. Pharmacol. Physiol.* 4(6):561-564; 1977.

The interaction of bradykinin and cholecystokinin preparations was investigated in the isolated guinea pig gallbladder. Bradykinin (1-100 ng/ml) induced dose-dependent contractile effects that were considerably smaller than those produced by cholecystokinin octapeptide. A low bradykinin concentration (1.0 ng/ml) caused a significant increase of the contraction induced by cholecystokinin octapeptide ($p<0.001$) and natural cholecystokinin-pancreozymin ($p<0.01$), and also augmented the effects of acetylcholine on this preparation. These effects are thus probably not specific for cholecystokinin.

1772 EFFECT OF VASOACTIVE INTESTINAL POLYPEPTIDE ON BASAL AND CHOLECYSTOKININ-INDUCED GALLBLADDER PRESSURE. (Eng.) Ryan, J.; Cohen, S. (Temple Univ. Sch. Medicine, Philadelphia, PA 19140). *Gastroenterology* 73(4, Part 1):870-872; 1977.

The pressure response of the opossum gallbladder to vasoactive intestinal polypeptide (VIP) alone and in combination with cholecystokinin (CCK) was studied *in vivo*. VIP alone (2.4 and 8 µg/kg/hr) produced dose-related decreases in basal gallbladder pressure ($p<0.05$). VIP eliminated spontaneous contractile activity when present, and it significantly antagonized the expected pressure response to CCK infusion. These observations support the proposal that the regulation of gallbladder motility depends upon the actions and interactions of the gastrointestinal hormones on gallbladder smooth muscle.

1773 CONDUCTION OF ACTIVITY BETWEEN MUSCLES IN THE TERMINAL REGION OF THE COMMON BILE DUCT AND IN THE NEIGHBORING DUODENUM. (Eng.) Nakayama, S.; Fukuda, H. (Okayama Univ. Medical Sch., Okayama 700, Japan). *Acta Med. Okayama* 30(1):21-35; 1976.

The relationship between muscle activity at the terminal region of the common bile duct and the duodenal muscle was examined in rabbits. Rhythmic muscle activity in the terminal region was synchronous with duodenal muscle activity. The activity of the latter muscle preceded the former. The activity at the terminal region synchronous with the rhythmic activity of the duodenal muscle sometimes disappeared spontaneously. At times, the muscle activity of the ampulla and the sphincter at the terminal region was independently lost. The conduction of excitation from the duodenal muscle to the terminal region appeared to occur at several sites. A "conduction-shunt path" probably exists between the terminal region and the duodenum, as well as between the ampulla and the sphincter. Some quantitative differences were found between the sphincter, ampulla, and duodenum in inhibitory effects to stimulation of splanchnic nerves and reflex effects and to excitatory effects of cholecystokinin-pancreozymin and cerulein. These results indicate that the sympathetic nerves and the intramural cholinergic neurons controlling the duodenal muscle and the terminal common bile duct

muscles carry out activities quantitatively different from each other.

1774 INHIBITION BY VIP AND SECRETIN OF THE LOWER ESOPHAGEAL SPHINCTER PRESSURE IN MAN [Abstract]. (Eng.) Domschke, W.; Lux, G.; Domschke, S.; Strunz, U.; Rosch, W.; Bloom, S. R.; *et al.* (Dept. Medicine, Univ. Erlangen-Nurnberg, Erlangen, W. Germany). *Acta Hepatogastroenterol. (Stuttg.)* 24(6):484-485; 1977.

1775 REFLUX OF DUODENAL CONTENTS INTO THE CANINE PANCREATIC DUCT [Abstract]. (Eng.) Hendricks, J. C.; DiMagno, E. P.; Dozois, R. R.; Go, V. L. W. (Mayo Clinic, Rochester, MN). *Clin. Res.* 25(4):607A; 1977.

1776 PRESSURE DYNAMICS IN THE SPHINCTER OF ODDI, PANCREATIC DUCT AND COMMON BILE DUCT IN MAN DURING ERCP MANOMETRIC STUDY [Abstract]. (Eng.) Hogan, W. J.; Geenen, J. E.; Dodds, W. J.; Stewart, E. T.; Arndorfer, R. C.; Shaffer, R. D. (Medical Coll. Wisconsin, Milwaukee, WI). *Clin. Res.* 25(4):607A; 1977.

1777 GLUCOSE DELAYS GASTRIC EMPTYING [Abstract]. (Eng.) Mayle, J. E.; Wolfe, M. M.; Caldwell, J. H.; Thomas, F. B. (Dept. Medicine, Ohio State Univ., Columbus, OH). *Clin. Res.* 25(4):572A; 1977.

1778 PROLONGATION OF SMALL BOWEL TRANSIT AND EXPANSION OF BILE ACID POOLS BY PROBANTHINE ADMINISTRATION IN MAN [Abstract]. (Eng.) Duane, W. C. (Veterans Admin. Hosp., Minneapolis, MN). *Gastroenterology* 73(5):1218; 1977.

1779 ^{99}Tc(m) TAGGED CHICKEN LIVER AS A MARKER OF SOLID FOOD IN THE HUMAN STOMACH. (Eng.) Meyer, J. H.; MacGregor, I. L.; Gueller, R.; *et al.* (Veterans Admin. Hosp., San Francisco, CA 94121). *Am. J. Dig. Dis.* 21(4):296-304; 1976.

1780 MEASUREMENT OF INTRAVESICAL AND RECTAL PRESSURES SIMULTANEOUSLY WITH ELECTROMYOGRAPHY OF ANAL SPHINCTER IN CHILDREN WITH MYELOMENINGOCELE. (Eng.) Van Gool, J. D.; De Ridder, A. L. A.; Kuijten, R. H.; *et al.* (St. Elizabeth Hosp., Tilburg, Netherlands). *Develop. Med. Child. Neurol.* 18(3):287-301; 1976.

1781 UNIFIED RHYTHM OF THE SLOW WAVE OF THE SMALL AND LARGE INTESTINES IN THE ILEOCECAL REGION. (Eng.) Mizhorokova, Z.; Papasova, M. (Inst. Physiology, Bulgarian Acad. Sciences, Sofia, Bulgaria). *Dokl. Bolg. Akad. Nauk.* 29(10):1535-1538; 1976.

1782 ANORECTAL PRESSURE PROFILE. (Ger.) Kaiser, G.; Reuter, I. (Inselspital, Bern, Switzerland). *Z. Kinderchir.* 19(1):38-49; 1976.

1783 THE MOTOR FUNCTION OF THE ANTRAL VAGUS NERVE. (Eng.) Lynen, F. K. (Dept. Surgery, Klinische Anstalten der RWTH Aachen, Goethestrasse 27/29, 51 Aachen, W. Germany). *Eur. Surg. Res.* 8(Suppl. 2):67-68; 1976.

1784 THE EFFECT OF PHTHALAPROMINE AND PRINDAMINE ON GASTRIC MOTILITY. (Eng.) Stadaas, J. O.; Aune, S.; Petersen, H. (Ulleval Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 11(Suppl. 42):127-128; 1976.

1785 EFFECT OF ANALGESIC AGENTS ON EMPTYING OF THE GALLBLADDER IN MAN. (Eng.) Sacchetti, G.; Roncoroni, L.; Mandelli, V.; *et al.* (Dept. Medicine, Carlo Erba, Milan, Italy). *Eur. J. Clin. Pharmacol.* 10(2):127-131; 1976.

1786 STUDIES ON INTRAVENOUS ANESTHESIA. XXV. EFFECTS OF VARIOUS INTRAVENOUS ANESTHETICS ON THE MOTILITY OF HUMAN SMALL INTESTINE. (Jpn.) Namiki, A. (Sapporo Medical Coll. Hosp., Sapporo, Japan). *Jpn. J. Anesthesiol.* 25(5):465-477; 1976.

See also, 1864, 1979, 2054, 2056, 2059, 2075, 2164, 2183, 2270, 2500, 2586.

SECRETION AND METABOLISM

1787 ENZYMATICALLY IODINATED HUMAN SALIVARY PROTEINS: FRACTIONATION AND CHARACTERIZATION BY COLUMN CHROMATOGRAPHY AND ELECTROFOCUSING. (Eng.) Sarimo, S. S.; Tenovuo, J. (Dept. Biochemistry, Univ. Turku, SF-20500 Turku 50, Finland). *Biochem. J.* 167(1):23-29; 1977.

Enzymically [^{125}I]iodinated human salivary proteins were analyzed by diethylaminoethane (DEAE)-cellulose chromatography, column electrofocusing, and thin-layer polyacrylamide-gel (flat-bed) electrofocusing. The salivary proteins were enzymically iodinated by the ^{125}I-lactoperoxidase system. Salivary proteins were found to differ in their susceptibility to iodination carried out by this enzymic method. Two major iodine-binding protein fractions were dis-

covered; one behaved like serum albumin on electrofocusing and was most susceptible to iodination by lactoperoxidase, and the other had pI characteristics similar to those of salivary amylase. The results suggest that iodoproteins may occur in human saliva. The significance of these iodoproteins may be related to the nonthyroidal metabolism of iodine.

1788 GLYCOPROTEIN SECRETION IN THE MOUSE SUBMANDIBULAR GLAND AS REVEALED BY RADIOAUTOGRAPHY AFTER L-^{3}H-FUCOSE INJECTION. (Eng.) Lima, T. G.; Haddad, A.; Fava-de-Moraes, F. (Instituto de Ciencias Biologicas, Universidade Federal de Minas Gerais, Caixa Postal 2486, 30000 Belo Horizonte/MG, Brazil). *Cell Tissue Res.* 183(4): 519-530; 1977.

Glycoprotein secretion was investigated by light microscope radioautography of semi-thin sections of the mouse submandibular gland after the administration of L-^{3}H-fucose (0.5 mCi, i.v.). The incorporation of the precursor in the acini was negligible. ^{3}H-fucose was taken up in the paranuclear region of the cells lining the intercalated, secretory, striated, and excretory ducts. This labeling pattern was interpreted as addition of the precursor to glycoproteins within the Golgi apparatus. Incorporation in the intercalated duct was restricted to the cells with fine cytoplasmic granules. The glycoproteins synthesized by the intercalated and secretory ducts were transported to the saliva by the secretion granules. It is assumed that the glycoproteins synthesized in the striated and excretory ducts are plasma membrane glycoproteins, which seem to renew continuously. Quantitation of the radioautographs supplied data concerning the incorporation of ^{3}H-fucose into newly synthesized glycoproteins as well as the renewal of the labeled macromolecules in each duct.

1789 INFLUENCE OF FOOD ON THE EFFECT OF 1-HYOSCYAMINE AND BENZILONIUMBROMIDE [Abstract]. (Eng.) Post, C.; Walan, A. (Dept. Clinical Pharmacology, Linkoping, Sweden). *Scand. J. Gastroenterol.* 12(Suppl. 45):72; 1977.

1790 EFFECTS OF VAGOTOMY ON THE STRUCTURE AND FUNCTION OF THE PARIETAL CELLS IN CATS [Abstract]. (Eng.) Helander, H. F.; Svensson, S. O.; Emas, S. (Dept. Anatomy, Univ. Lund, Lund, Sweden). *Acta Hepatogastroenterol. (Stuttg.)* 24(6):483-484; 1977.

1791 VIP INFUSION IN MAN [Abstract]. (Eng.) Bloom, S. R.; Mitchell, S. J.; Domschke, S.; Domschke, W.; Mitznegg, P.; Lux, G.; *et al.* *Gut* 18(11):A963; 1977.

See also, 1743, 1973, 2318, 2319, 2605.

SECRETION AND METABOLISM

Stomach

1792 CYCLIC AMP AND CYCLIC GMP LEVELS IN GLANDULAR STOMACH OF RESTRAINED RATS. (Eng.) Zarrindast, M. R.; Sharghi, G.; Gerayesh-Nejad, S.; Djahanguiri, B. (Sch. Medicine, Univ. Tehran, Tehran, Iran). *Res. Commun. Chem. Pathol. Pharmacol.* 18(2):373-376; 1977.

Cyclic AMP and cyclic GMP were measured in the glandular stomach of Sprague-Dawley rats subjected to saline administration, cold (4 C), restraint, and restraint plus cold stress after 15, 30, 60, 90, and 120 min to determine the possible relationship between cyclic nucleotides and the development of stress ulcers. All animals subjected to restraint plus cold had gastric ulceration after 2 hr. A significant but transient decrease in cyclic AMP was observed 15 min after restraint plus cold. A marked, sustained and significant decrease of cyclic GMP was observed in the same group of animals. It seems unlikely that there is a correlation between cyclic AMP and cyclic GMP changes of the stomach and restraint-induced gastric ulceration.

1793 EFFECT OF ACETYLSALICYLIC ACID ON THE AMPHIBIAN GASTRIC MUCOSA. I. ELECTROPHYSIOLOGICAL AND PERMEABILITY CHANGES. (Eng.) Spenney, J. G.; Bhown, M. (Dept. Medicine, Univ. Alabama in Birmingham, Birmingham, AL 35294). *Gastroenterology* 73(4):785-789; 1977.

To study mechanisms by which aspirin alters ion transport in the stomach, electrophysiological and permeability changes were studied in the *in vitro* bullfrog gastric mucosa after an exposure of 10 or 20 mM acetylsalicylic acid. The potential difference and resistance rose initially. After 15 to 30 min of exposure, the potential difference declined to zero. Transmucosal resistance remained elevated considerably longer, but began to decline

toward zero after 30-60 min of exposure. Mucosal permeability to mannitol increased as transmucosal resistance declined, but was not markedly elevated until the second hour of exposure to acetylsalicylic acid. The initial rise of potential difference was associated with inhibition of H^+ secretion, whereas the later decline of potential difference was due to inhibition of Cl^- transport. The abolition of short circuit current could not be attributed to mucosal to serosal flux of acetylsalicylate.

1794 EFFECT OF ACETYLSALICYLIC ACID ON GASTRIC MUCOSA. II. MUCOSAL ATP AND PHOSPHOCREATINE CONTENT, AND SALICYLATE EFFECTS ON MITOCHONDRIAL METABOLISM. (Eng.) Spenney, J. G.; Brown, M. (Dept. Medicine, Univ. Alabama, University Station, Birmingham, AL 35294). *Gastroenterology* 73(5):995-999; 1977.

The effects of acetylsalicylic acid on gastric mucosal ATP, phosphocreatine, and O_2 consumption were studied *in vitro* in the bullfrog gastric mucosa. Potential difference and resistance changed rapidly after exposure to 10 or 20 mM acetylsalicylic acid at pH 3.0, 4.0, or 6.0 in the mucosal solution. ATP and phosphocreatine content decreased rapidly after exposure. Control mucosae contained 11.8 ± 0.98 nmol ATP and 11.5 ± 0.68 nmol of phosphocreatine per mg of protein. ATP content decreased by 21% and phosphocreatine by 45% after 15-30 min of exposure. Longer durations of exposure reduced both ATP and phosphocreatine levels to 10-15% of the controls. Oxygen consumption was increased during the first 15-30 min after exposure to acetylsalicylate. Longer durations of exposure reduced O_2 consumption to near control levels. Acetylsalicylate itself did not significantly affect mitochondrial respiration, respiratory control ratio, or ADP:O ratio. Salicylate had a biphasic effect that was concentration-dependent. Salicylate initially stimulated and later inhibited mitochondrial respiration. Using various substrates, the site of inhibition appeared to be located in the segment of the respiratory chain between coenzyme Q and cytochrome c_1. It is proposed that acetylsalicylate-induced mucosal injury includes absorption by diffusion from the acid contents of the lumen. Intracellularly, acetylsalicylic acid is hydrolyzed by an esterase to yield salicylate in sufficient concentration to uncouple and/or inhibit mitochondrial oxidative phosphorylation. As a result, ATP and phosphocreatine content decline, and many synthetic and transport activities cease.

1795 EFFECTS OF PROLONGED METIAMIDE MEDICATION ON THE FUNDIC MUCOSA: A SECRETORY AND HISTOMORPHOMETRIC STUDY IN THE RAT. (Eng.) Witzel, L.; Halter, F.; Olah, A. J.; Hacki, W. H. (Inselspital, CH-3010 Berne, Switzerland). *Gastroenterology* 73(4):797-803; 1977.

Secretory and histomorphometric studies were carried out to determine the effect of long-term metiamide treatment on the parietal cell mass. Two groups of 10 rats each were treated with metiamide (200 mg/kg, s.c.) or with saline (0.15 M, 2 ml/kg, s.c.) at 8-hr intervals over 18 days. Eight hours after cessation of the treatment, basal secretion was not significantly altered, except for increased H^+ concentration in the metiamide group. Pentagastrin stimulation led to a significant rise in gastric juice volume (+18%), H^+ concentration (+50%), and acid output (+27%). In saline-treated controls no changes were observed. In the fundic mucosa, there was a significant increase in total number (+15%), total volume (+29%), and volume density (+11%) of parietal cells. These changes were attributable to increased volume of the individual parietal cell (+13%) and to increased fundic mucosal volume (+18%). Stimulated acid output correlated closely with both the total number and total volume of parietal cells. In an additional group of 10 rats, the mean serum gastrin levels rose significantly 2 hr after a single injection of metiamide (200 mg/kg, s.c.) in fasted and nonfasted conditions. It is concluded that in the rat prolonged administration of metiamide induces hypertrophy of the parietal cells, probably via hypergastrinemia, and leads to gastric hypersecretion after discontinuation of the medication.

1796 EFFECTS OF 7-OXA-13-PROSTYNOIC ACID (7-OPyA) AND PROSTAGLANDIN E_1 METHYL ESTER ON CANINE GASTRIC SECRETION. (Eng.) Dajani, E. Z.; Driskill, D. R. (Dept. Biological Res., Searle Lab., P.O. Box 5110, Chicago, IL 60680). *Prostaglandins* 14(4):659-666; 1977.

The effects of 7-oxa-13-prostynoic acid (7-OPyA) on prostaglandin E_1 (PGE_1)-induced inhibition of gastric secretion were studied in unanesthetized dogs. Secretion was stimulated by the continuous i.v. infusion of histamine (1.0 mg/hr). At the steady-state plateau of gastric secretion, PGE_1 methyl ester (PGE_1 ME, 1.0 µg/kg/min) or PGE_1 ME and 7-OPyA (20-50 µg/kg/min) were simultaneously infused i.v. The extent of gastric secretory inhibition afforded by PGE_1 ME alone or in the presence of 7-OPyA was assessed. 7-OPyA did not modify PGE_1 ME gastric antisecretory actions when administered at doses 20-50 times greater than the dose of PGE_1 ME. These results suggest that the prostaglandin antagonist effects of 7-OPyA show organ specificity, which finding may be of clinical importance.

1797 ANTROPYLORIC G-CELL HYPERPLASIA IN HYPERCALCEMIC RABBITS BEARING THE VX_2 CARCINOMA. (Eng.) Dayal, Y.; Voelkel, E. F.; Tashjian, A. H., Jr.; DeLellis, R. A.; Wolfe, H. J. (New England Medical Center Hosp., 171 Harrison Ave., Boston, MA 02111). *Am. J. Pathol.* 89(2):391-400; 1977.

The distribution and the numbers of G cells in the gastric antropyloric region of hypocalcemic rabbits bearing the VX_2 carcinoma were mapped employing immunoperoxidase localization and morphometric quantitation and compared with that in the normal rabbit stomach. In normal animals, G cells were

confined to the lower third of the antropyloric mucosa, where they were randomly distributed within the mucosal glands. In contrast, tumor-bearing animals showed an extension of these cells into the middle third of the antropyloric mucosa. The absolute counts of G cells in control rabbits were 5.3 ± 0.78 per unit area, while those in hypercalcemic tumor-bearing rabbits were 11.9 ± 0.46 per unit area ($p<0.05$). It is concluded that rabbits bearing the VX_2 carcinoma have G-cell hyperplasia.

1798 LOCALIZATION OF GASTRIN RECEPTORS IN INTACT ISOLATED AND SEPARATED RAT FUNDIC CELLS. (Eng.) Soumarmon, A.; Cheret, A. M.; Lewin, M. J. M. (Hopital Bichat, 170 Boulevard Ney, Paris 75018, France). *Gastroenterology* 73 (4):900-903; 1977.

The cellular localization of previously described "high affinity" receptor sites ($K=0.60-0.80\ 10^{-8}$) for gastrin in purified plasma membranes from rat fundic mucosa was investigated. Dispersed rat fundic cells were prepared by pronase dissociation. Populations of 10% to 70% "large cells" (i.e., parietal cells) were obtained by successive 100 x *g* 45-sec centrifugations. Of the cells, 93 ± 5% excluded trypan blue; oxygen consumption ranged from 3.5 (10% large cells) to 15 nmol O_2/min/10^6 cells (70% large cells); cell ultrastructural integrity was well preserved. ^{3}H-labeled G17-I binding to isolated cells was temperature-dependent, proportional to cell concentration, reversible, and a saturable process as a function of time and hormone concentration. Association and dissociation rate constants were $K_1=0.69 \times 10^7$/M/min and $K_{-1}=0.063$/min, resp., at 20 C, pH 7.4. A Scatchard plot of the binding suggested a single class of binding sites with an equilibrium constant $K=0.90 \times 10^{-8}$ M and a maximum binding capacity of 7,500 sites per cell (crude suspension). Binding increased linearly as a function of the enrichment in parietal cells, the theoretical maximum binding capacity (100% parietal cell population) being 14,000 to 19,000 sites per cell. These findings on intact fundic cells compare favorably with those previously found on their derived plasma membranes. It is therefore suggested that, in the rat, parietal cells contain the high affinity gastrin receptors.

1799 THE GASTRIN-PRODUCING CELLS IN TISSUE CULTURES OF THE RAT PYLORIC ANTRUM. (Eng.) De Schryver-Kecskemeti, K.; Greider, M. H.; Saks, M. K.; Rieders, E. R.; McGuigan, J. E. (Div. Surgical Pathology, Washington Univ., St. Louis, MO 63110). *Lab. Invest.* 37(4):406-410; 1977.

Tissue culture methods for the study of gastrin-producing cells isolated from the pyloric antral mucosa of male Wistar rats are described. Gastrin cell cultures were maintained for up to 7 days, with the largest number of well-defined cells seen on days 3 and 4. Gastrin cells were identified by means of immunofluorescent and unlabeled antibody-enzyme techniques. The tissue culture medium was monitored for basal gastrin secretion. In addition, stimulation of gastrin release was achieved by the use of dibutyryl cyclic-AMP and theophylline. The fact that gastrin cell cultures responded specifically and repetitively to stimulation supports the conclusion that this tissue culture approach maintains functional integrity of the gastrin cell and may be used to study the regulatory mechanism of gastrin secretion.

1800 STRUCTURE-FUNCTION RELATIONSHIPS OF PEPTIDE FRAGMENTS OF GASTRIN AND CHOLECYSTOKININ. (Eng.) Kaminski, D. L.; Ruwart, M. J.; Jellinek, M. (Saint Louis Univ. Sch. Medicine, St. Louis, MO 63104). *Am. J. Physiol.* 233(4):E286-E292; 1977.

The structure-function relationships of the C-terminal peptide fragments of gastrin and cholecystokinin (CCK) were evaluated in the canine biliary system and the stomach. Dogs with chronic biliary and gastric fistulas were used. The administration of the common fragments of cholecystokinin (CCK) and gastrin with four and five amino acids and the active fragments of CCK with six through eight amino acids without sulfation of tyrosine in position 7 failed to alter hepatic bile flow from control values, while they significantly stimulated gastric hydrogen ion output. The administration of the seven and eight amino acid peptide fragments of CCK with sulfation of tyrosine in position 7 significantly increased hepatic bile flow. The administration of the sulfated octapeptide with 4 μg/kg/hr of nonsulfated octapeptide did not result in the inhibition of the choleresis produced by the sulfated peptide. The gastric hydrogen ion response produced by the administration of the nonsulfated and sulfated peptide was equal to that of the nonsulfated peptide alone. These results suggest that in the biliary system the receptor is highly specific as sulfation of the peptide fragment of CCK is essential for combining with the receptor, whereas in the stomach the receptor has little specificity and combines with all of the peptide fragments evaluated.

1801 RELEASE OF ANTRAL AND DUODENAL GASTRIN IN RESPONSE TO AN INTESTINAL MEAL. (Eng.) Llanos, O. L.; Villar, H. V.; Konturek, S. J.; Rayford, P. L.; Thompson, J. C. (Univ. Texas Medical Branch, Galveston, TX 77550). *Am. Surg.* 186(5): 614-618; 1977.

The release of antral and duodenal gastrin was studied during the intestinal phase of gastric secretion, and the influence of the pH of the meal and of the antrum on the release of antral and duodenal gastrin was investigated. In dogs prepared with isolated, innervated antral pouches, intraduodenal perfusion with liver extract at pH 7, with the antrum buffered at pH 7, resulted in a significant release of gastrin selectively from the antrum (from 118 ± 13 pg/ml to 261 ± 58 pg/ml) and from the duodenum (124 ± 25 to 404 ± 100 pg/ml). Acidification of the meal to pH 1 abolished both antral and duodenal gastrin release, whereas acidification of the

antrum abolished only the antral gastrin response. After antrectomy, liver extract at pH 7 caused a diminished but significant release of duodenal gastrin. These studies indicate that an intestinal meal may release (in addition to a specific intestinal phase hormone) gastrin from the intestine and from antrum, by means of a pH-sensitive mechanism that may involve a humoral agent from the small bowel.

1802 STIMULATION OF GASTRIN RELEASE AND GASTRIC SECRETION BY AMINO ACIDS BATHING PYLORIC GLAND AREA. (Eng.) Konturek, S. J.; Tasler, J.; Cieszkowski, M.; Dobrzanska, M.; Wunsch, E. (Medical Acad., Krakow, Poland). *Am. J. Physiol.* 233 (3):E170-E174; 1977.

The potency of L- and D-isomers of 18 natural amino acids (AA) bathing the pyloric gland area in stimulating gastrin release and gastric acid secretion was compared in three dogs with denervated antral (AP) and Heidenhain pouches (HP) and gastric fistulas (GF). L-isomers of all natural AA stimulated acid secretion from the HP, whereas D-isomers were significantly less effective. The most potent L-isomers of AA were phenylalanine, alanine, and glycine, which caused an increase in acid output reaching 36%, 29%, and 26%, resp., of the maximal response to histamine (MRH). The strongest stimulants of acid secretion were relatively weak releasers of gastrin. Irrigation of the AP with increasing concentrations of L-phenylalanine (0.1-0.8 M), liver extract (2.5-20%), and acetylcholine (0.1-0.8%) resulted in a stepwise increase in acid reaching 31%, 22%, and 12% of the MRH, resp. Three gastrin peptides (G-14, G-17, and G-34), infused in graded doses (6.2-100 pmol/kg/hr), produced a dose-related increase in acid output, reaching 25%, 17%, and 17%, resp., of the MRH. The increment in serum gastrin was also dose-related and similar with G-14 and G-17 administration but significantly higher with G-34 administration. All L- and, to a lesser degree, D-isomers of natural AA bathing the pyloric gland area caused stimulation of gastric acid secretion that can be only partially explained by release of the major gastrin peptides.

1803 OPPOSITE EFFECTS OF GASTRIN ON CELL PROLIFERATION IN THE ANTRUM AND OTHER PARTS OF THE UPPER-GASTROINTESTINAL TRACT IN THE RAT. (Eng.) Casteleyn, P. P.; Dubrasquet, M.; Willems, G. (St. Pierre Hosp., Hoogstraat, 322, B 1000 Brussels, Belgium). *Am. J. Dig. Dis.* 22(9):798-804; 1977.

The effect of gastrin on DNA synthesis and mitotic activity in the mucosa of the upper gastrointestinal tract was examined by autoradiography in unanesthetized Wistar rats with a gastric fistula. Animals were killed at 4-hr intervals, after starting a 3-hr i.v. infusion with the lowest dose of gastrin provoking a maximal acid output. Tritiated thymidine was injected 1 hr before killing. Labeling and mitotic indices were estimated in the fundic, antral, duodenal, and jejunal mucosa. The proliferative activity in the fundic, duodenal, and jejunal glands was significantly increased 16 hr after gastrin administration. In the antral glands, however, a significant decrease in both labeling and mitotic indices was observed ($p<0.05$ and $p<0.01$, resp.). Rhythmic variations in proliferative activity were observed in the antral, duodenal, and jejunal mucosa in controls. They were different from those in the gastrin-treated animals. The data confirm the trophic action of gastrin in the fundic, duodenal, and jejunal mucosa. They also indicate an inhibitory effect of this hormone on cell proliferation in the antral mucosa.

1804 THE EFFECT OF ATROPINE ON ACID SECRETION STIMULATED BY ACETYLCHOLINE, HISTAMINE AND GASTRIN IN THE ISOLATED WHOLE STOMACH OF THE RAT. (Eng.) Bunce, K. T.; Marsh, G. F.; Parsons, M. E. (Smith Kline and French Lab. Ltd., Welwyn Garden City, Hertfordshire, England). *Br. J. Pharmacol.* 61(2):279-284; 1977.

Isolated stomach preparations from immature rats were used to study the effect of atropine on gastric acid secretion stimulated by histamine, gastrin, and acetylcholine. The acid secretory response to acetylcholine was not inhibited by 0.3 μM atropine. Atropine at 1 to 3 μM produced a measurable inhibition of acid secretion, and atropine at 10 μM caused a complete block of acid secretion, which could not be surmounted by high concentrations of acetylcholine (3-10 mM). The acid secretory response to histamine was not inhibited by concentrations of up to 1 mM of atropine. Atropine concentrations of 1 μM and 10 μM did not inhibit gastrin-stimulated acid secretion, although a significant inhibition of acid output was observed at atropine concentrations of 0.1 mM and 1 mM.

1805 DUODENAL ULCEROGENS, CYSTEAMINE AND PROPIONITRILE, STIMULATE SERUM GASTRIN LEVELS IN THE RAT. (Eng.) Lichtenberger, L. M.; Szabo, S.; Trier, J. S. (Univ. Texas Medical Sch., P.O. Box 20708, Houston, TX 77025). *Gastroenterology* 73(6):1305-1308; 1977.

To determine the role of gastrin in the mechanism by which cysteamine and propionitrile induce duodenal ulcer formation, these drugs were administered to fasted female Sprague-Dawley rats, and their effect on fasting and food-stimulated serum gastrin levels was studied. Intragastric administration of cysteamine (28 mg/100 g) caused a three- to fourfold increase in fasting serum gastrin levels over the values of controls. Propionitrile (6-12 mg/100 g) was a less effective stimulant of gastrin release, causing a 1.5- to 2-fold increase in gastrin levels over matched controls. The food-stimulated rise in serum gastrin levels after either a chow meal or intragastric instillation of a peptone solution was markedly enhanced by cysteamine pretreatment. Three hours after feeding, the serum gastrin levels of cysteamine-pretreated rats were six times higher than those of fed controls. The high serum gastrin levels of cysteamine-pretreated fed rats could not

be explained solely by the additive effects of cysteamine and food, indicating that a potentiating interaction may exist between the two stimulants of gastrin release. The importance of this drug-induced stimulation of gastrin release, under both fasted and fed conditions, in the ulcerogenic process has yet to be ascertained.

1806 ON THE CAUSE OF THE INCREASED HEIDENHAIN POUCH SECRETION AND SERUM GASTRIN CONCENTRATION AFTER GASTROJEJUNOSTOMY IN DOGS: WITH A STATISTICAL APPENDIX. (Eng.) Rokkjaer, M.; Host, V.; Brandsborg, O.; Brandsborg, M.; Lovgreen, N. A. (Kommunehospitalet, DK-8000 Aarhus C, Denmark). *Gastroenterology* 73(5):1065-1071; 1977.

The possible importance of reduced duodenal inhibition of gastric acid secretion, reflux or regurgitation of alkaline duodenal contents, gastric stasis resulting from gastrin release, and increased intestinal stimulation of gastric secretion in the increased Heidenhain pouch (HP) secretion seen after gastrojejunostomy (GEA) in dogs was investigated. In 10 dogs with HP, a GEA was constructed and later converted into a Roux-en-Y anastomosis to abolish or reduce trans-stomal reflux. Next, duodenal inhibition was abolished by duodenal transection, and finally the duodenal bulb was excised. The 24-hr HP acid output increased after GEA, some 70% of the increase being attributable to trans-stomal reflux, the rest to decreased duodenal inhibition. Abolished duodenal inhibition caused a new rise, not significantly different from that caused by the combined effect of reflux, and decreased duodenal inhibition after GEA. The 24-hr fasting HP acid output and 5-hr food-stimulated HP acid output rose after GEA by the same amount as that caused by abolished duodenal inhibition. A significant correlation was found between integrated gastrin and total HP acid output after food stimulation. Both fasting and food-stimulated gastrin concentration rose after GEA, the latter caused by reflux alone. Elimination of duodenal inhibition caused an unexpected rise in both fasting and food-stimulated gastrin concentration.

1807 EFFECT OF MULTIPLE-STRESS PROCEDURES ON MONKEY GASTRODUODENAL MUCOSA, SERUM GASTRIN, AND HYDROGEN ION KINETICS. (Eng.) Natelson, B. H.; Dubois, A.; Sodetz, F. J. (New Jersey Medical Sch., 88 Ross St., East Orange, NJ 07018). *Am. J. Dig. Dis.* 22(10):888-897; 1977.

The effect of frequently changing and stressful performance demands on the condition of the gastroduodenal mucosa, the serum gastrin level, and H^+ kinetics was studied in rhesus monkeys. By arranging a series of psychological contingencies (unpredictability, uncontrollability, conflict), coupled with delivery of a physical stimulus (electric shock), gastroduodenal mucosal lesions were produced in seven of eight monkeys. The most severe conflict paradigm most consistently produced lesions across subjects. Of the 30 lesions observed by endoscopy, 80% occurred near the anatomic junction of gastric body and antrum, in the antrum, or in the duodenum. Lesions varied in severity from discolcrations of the mucosa to disruptions of mucosal integrity. Gastric lesions generally disappeared in several days, despite the continuation of stress; some duodenal lesions were equally evanescent, but in two monkeys, lesions lasted over 1 week. Hydrogen ion kinetics were measured in two monkeys that developed gastric lesions and two that developed duodenal lesions. The rate at which hydrogen ion entered the duodenum was uniformly suppressed for all four monkeys during their first session of shock avoidance; during their last session, the gastric subgroup continued to show suppression while the duodenal subgroup returned towards control levels. Serum gastrin levels were unchanged by the multiple-stress procedures. The finding of consistently producible, stress-induced gastroduodenal pathology in anatomic areas similar to those involved in man suggests that the subhuman primate is suitable for further efforts to produce an animal model of psychosomatic ulcer disease.

1808 EFFECTS OF FASTING AND PENTAGASTRIN ON PROTEIN SYNTHESIS BY ISOLATED GASTRIC MUCOSAL RIBOSOMES IN A CELL-FREE SYSTEM. (Eng.) Nandi Majumdar, A. P.; Goltermann, N. (Inst. Medical Biochemistry, Univ. Aarhus, DK-8000 Aarhus C, Denmark). *Gastroenterology* 73(5):1060-1064; 1977.

Gastric mucosal polyribosomes, isolated from fasted, fed, and pentagastrin-treated fasted rats were studied for their ability to support protein synthesis in a cell-free system. Groups of Wistar rats were either fed *ad libitum* or fasted for 48 hr, and pentagastrin (500 µg/kg) was then injected to one fasted group, while the other fasted and fed groups received 0.9% saline. Liver cell sap, prepared from normal fed rats was used as a source for activating enzymes in the cell-free systems. The rate of [^{14}C]amino acid incorporation into protein by gastric mucosal polyribosomes from nonfasted and pentagastrin-injected rats was considerably higher than that of the fasted control. One hour after the hormone injection, ribosomal protein synthesis was 40% higher than in the control. However, 1.5 and 6 hr after the hormone treatment, the increments were 22% and 15% above the respective controls. A prolongation of the fasting period itself from 48 to 54 hr caused a 7% reduction in ribosomal protein synthesis. The protein to phenylalanine ratio, which represents a ratio of polysomes to monosomes, was 100% above the fasted controls 1 hr after pentagastrin injection. In the absence of polyuridylic acid [poly(U)], the incorporation of [^{14}C]phenylalanine into protein by polyribosomes from the pentagastrin-injected rats was 65% higher than the fasted control, whereas in the presence of poly(U), the control ribosomes showed a 20% increased incorporation. Polyphenylalanine synthesis by the control ribosomes was also 30% above the hormone-treated group. The more active response of the control ribosomes to poly(U) may be attributable to the presence of a higher proportion of monosomes in the preparation.

1809 EFFECT OF METHACHOLINE ON ACID AND PEPSIN RESPONSES TO PENTAGASTRIN IN CATS WITH INNERVATED AND DENERVATED FUNDIC POUCHES. (Eng.) Svensson, S. O.; Dubrasquet, M.; Emas, S. (Karolinska Sjukhuset, Stockholm, Sweden). *Surgery* 82(5): 580-587; 1977.

The effect of threshold dose of methacholine (15 or 20 μg/kg/hr, i.v.) on gastric secretion stimulated by pentagastrin (PG) was studied in four cats with Pavlov pouches (PP) and in four with Heidenhain pouches (HP). In the PP group, methacholine did not alter either the maximal response (MR) or the dose producing half of the maximal response (D_{50}) for PG. In the HP group, the highest acid response to PG combined with methacholine was greater than the MR to PG alone. Methacholine decreased the D_{50} for PG in the HP group to that in the PP group with and without methacholine ($p<0.001$ and $p<0.05$, resp.). Methacholine increased the pepsin response to all doses of PG both in the PP ($p<0.001$) and the HP groups ($p<0.05$ to $p<0.001$). The effect was more pronounced in the HP group. In both types of pouches, the percentage increase of pepsin secretion was larger at low than at high doses of PG. Methacholine increased the pepsin/acid (P/A) ratio for PG in the HP group to that in the PP group with and without methacholine. Accordingly, methacholine sensitized the oxyntic glands and increased the pepsin response to PG in the HP group as did basal vagal tone in the PP group. Methacholine did not further sensitize the innervated oxyntic glands to gastrin but increased the response of the peptic glands. It is concluded that a threshold dose of methacholine produces equal sensitization of the oxyntic cells to PG in the HP as basal vagal tone in the PP but produces no further sensitization in the PP. A threshold dose of methacholine increases the acid secretory capacity only in the HP. The pepsin responses of the PP and HP to various doses of PG are increased by a threshold dose of methacholine, which also mimics basal vagal tone by increasing the P/A ratio for PG in the HP to that in the PP.

1810 COMPARISON OF THE INHIBITION OF HISTAMINE- AND PENTAGASTRIN-STIMULATED GASTRIC ACID SECRETION BY SOMATOSTATIN IN THE CAT. (Eng.) Albinus, M.; Reed, J. D.; Gomez-Pan, A.; Schally, A. V.; Coy, D. H. (Dept. Pharmacology, Univ. Tubingen, Tubingen, W. Germany). *Agents Actions* 7(5/6):501-506; 1977.

The inhibitory effect of cyclic somatostatin on pentagastrin- and histamine-stimulated gastric acid secretion in normal and vagotomized gastric fistula cats was investigated. Histamine dose-response curve experiments in cats with intact vagus nerves showed that at low doses of histamine, 4 or 10 μg/kg/hr of somatostatin produced a significant reduction in gastric acid output, and at any one dose of histamine, this inhibition was somatostatin dose-dependent. However, as the dose of histamine was increased to produce maximum gastric secretory rates, neither 4 nor 10 μg/kg/hr of somatostatin produced inhibition of gastric acid output. The result was a dose-response curve converging with no inhibition at a histamine dose of 250 μg/kg/hr. The infusion of somatostatin (10 μg/kg/hr) during stimulation of gastric acid secretion by pentagastrin (8 μg/kg/hr) in cats with intact vagus nerves resulted in rapid inhibition of gastric acid secretion that reached 95% in the last 30 min of the somatostatin infusion. Following the end of this infusion, the gastric acid secretion rapidly returned to control values. With pentagastrin stimulation, somatostatin produced parallel displacement of the dose-response curves. It is suggested that somatostatin competitively inhibits pentagastrin-stimulated gastric acid secretion, whereas it inhibits histamine-stimulated secretion by a mechanism that is not competitive in nature. The vagus nerves seem to be involved in the mode of action of somatostatin, since the inhibitory effects of somatostatin were greater in vagotomized than in vagus-intact animals.

1811 ELECTRICAL EVENTS DURING ACTIVATION AND INHIBITION OF GASTRIC HCl SECRETION. (Eng.) Rehm, W. S.; Sanders, S. S. (Medical Center, Univ. Alabama in Birmingham, University Station, Birmingham, AL 35294). *Gastroenterology* 73(4): 959-969; 1977.

Some of the relationships between the secretory rate and the electrophysiological characteristics of the canine and frog gastric mucosa are reviewed. There is no simple relationship between the potential difference (PD) and H^+ rate in the *in vitro* frog gastric mucosa with standard Cl^- bathing solutions. In contrast, with Cl^--free solutions (PD is inverted), there is a precise linear relation between the PD and the H^+ rate. This linear relationship strongly supports the concept that the H^+ mechanism under these conditions is electrogenic. In the past, it has been difficult to exclude the possibility that the inverted PD is due to a liquid junction potential between acid fluid in the lumina and the secretory bathing solution. The use of aminopyrine or imidazole essentially eliminates the possibility that the inverted PD is due to a liquid junction potential. Hence, the linear relationship is solid evidence for the electrogenicity of the H^+ mechanism. Recently, aminopyrine and imidazole have been shown to reverse thiocyanate inhibition of H^+ secretion.

1812 ABSOLUTE DEPENDENCE ON CHLORIDE FOR ACID SECRETION IN ISOLATED GASTRIC GLANDS. (Eng.) Berglindh, T. (Biomedical Center, Univ. Uppsala, P.O. Box 572, S-751 23 Uppsala, Sweden). *Gastroenterology* 73(4):874-880; 1977.

To gain information concerning the nature of chloride transport and its interactions with H^+ secretion in the mammalian parietal cell, the behavior of isolated rabbit gastric glands in chloride-free solutions was studied. The glands lost their ability to accumulate H^+ ions when incubated in Cl^--free solutions, as measured by accumulation of the weak base aminopyrine (AP). Simultaneously, basal oxy-

gen consumption was significantly increased (+56%). Addition of histamine or dibutyryl cyclic AMP (db-cAMP) further increased the respiration, but only a minor increment in the AP accumulation was seen. Addition of Cl^- dose-dependently increased the AP accumulation back to normal basal values, a function that was coupled with a progressive decrease in oxygen consumption down to the normal level. ED_{50} for AP accumulation was 15.0 mM Cl^-. SCN^- also decreased the respiratory rate, but did not restore AP accumulation. Increasing the K^+ concentration of the Cl^--free solution 10-fold did not affect the AP ratio per se, but facilitated the rise in AP accumulation upon addition of Cl^-. At standard Cl^- concentrations the final AP ratio was significantly increased above that of glands incubated at normal K^+ concentrations. The addition of Br^- to the chloride-free medium induced responses indistinguishable from those of Cl^-, whereas I^- showed less affinity and was inhibitory at higher concentrations (>20 mM). Studies on AP accumulation kinetics showed that the addition of Cl^- to glands pretreated with db-cAMP did not induce a more rapid accumulation than that seen in glands to which db-cAMP and Cl^- were added simultaneously. This might indicate that db-cAMP does not induce a morphological transformation of the parietal cell into a secreting state in the absence of Cl^-. As one explanation for the results obtained, a Cl^--HCO_3^- exchange mechanism in the secretory membrane is proposed, which implies that HCO_3^- handling in the secretory membrane is impaired in the absence of Cl^- and that this could lead to a neutralization of the H^+ ions formed.

1813 EVIDENCE FOR A HISTAMINE H_2 RECEPTOR THAT INHIBITS PEPSIN SECRETION IN THE DOG. (Eng.) Hirschowitz, B. I.; Hutchison, G. A. (Dept. Medicine, Univ. Alabama, Birmingham, AL 35294). *Am. J. Physiol.* 233(3):E225-E228; 1977.

Acid and pepsin output were studied in four gastric fistula dogs treated with histamine and in five dogs treated with 4-methylhistamine [4(Me)H]. Each amine was given in 45-min incremental step doses to constitute full dose-response curves (histamine: 2, 5, 10, 20, 50, 100, and 150 µg/base/kg/hr; 4-methylhistamine: 1.5, 3.5, 7, 15, 35, 70, and 105 µg/kg/hr). Pepsin output was biphasic with both drugs. Peak pepsin output occurred at low doses (≤5 µg/kg/hr) and progressive inhibition of output was seen at higher doses, but H^+ output was stimulated at all doses. Cimetidine (1 mg/kg/hr) competitively inhibited H^+ stimulation. The pepsin response to histamine or 4(Me)H was converted to a positive logsigmoid response when cimetidine was given at the same time. In the presence of cimetidine (1 mg/kg/hr), the outputs of H^+ and pepsin were positively correlated in the full histamine dose range. These data show that histamine effects on pepsin secretion are a mixture of stimulation and inhibition and that the receptor responsible for pepsin stimulation is of a high affinity, low K_m, H_2 type, whereas inhibition at high doses of histamine is probably mediated by a low affinity, high K_m receptor, also H_2 type.

1814 EFFECT OF HISTAMINE RECEPTOR ANTAGONISTS ON BILE DAMAGE TO THE GASTRIC MUCOSA OF CANINE HEIDEHAIN POUCHES. (Eng.) Rees, W. D. W.; Rhodes, J.; Wheeler, M. H.; Meek, E. M.; Williams, B.; Newcombe, R. G. (Univ. Hosp. Wales, Wales, Cardiff, Wales). *Gut* 18(10):821-826; 1977.

The effect of combined H_1 and H_2 histamine receptor antagonists (mepyramine maleate or metamide, resp.) on damage to the gastric mucosal barrier produced by sodium taurocholate was studied. Four mongrel dogs were prepared with gastric Heidenhain pouches two months before the experiment. Changes in the volume, ionic (H^+ and Na^+) concentrations and flux, and transmucosal potential difference were determined in three 30-min periods. In periods I and III, a standard acid solution was placed in a pouch, and in period II, bile (sodium taurocholate) was given. Dogs were also given i.v. injections of H_1 or H_2 receptor antagonists, alone or in combination (mepyramine maleate, 10 mg/kg during period I, or metamide, 200 µM/50 ml/hr throughout the experiment). In control experiments (normal saline, 50 ml/hr, i.v.), there was a small loss of the pouch fluid during period I, but the volume increased by 1.2 ml during period II ($p<0.01$); a small increase occurred in period III. There was a decrease in H^+ concentration, especially in period II (-4.7 µM/ml, $p<0.05$). An increase in Na^+ concentration was maximum in period II (+3.3 µM/ml, $p<0.025$). The changes in H^+ and Na^+ ion flux followed the pattern described for the changes in ion concentration. The transmucosal potential difference remained steady during period I (-43 mV); it decreased significantly in period II ($p=0.02$); and then increased during period III. Similar results were obtained when either H_1 or H_2 antagonists were given. The histamine content in pouch fluid was 0.030 µg/ml in controls and during period I; it increased to 0.066 µg/ml during period II. When H_1 and H_2 antagonists were given together, the comparable values were 0.055 µg/ml and 0.058 µg/ml, resp. The combined effect of H_1 and H_2 antagonists appears to reduce or abolish changes in the volume and ionic fluxes produced by sodium taurocholate. The results suggest that histamine mediates changes in the transmucosal ionic flux produced by bile acid.

1815 EFFECT OF ANTRECTOMY ON GASTRIC HYPERSECRETION INDUCED BY DISTAL SMALL BOWEL RESECTION. (Eng.) Hall, A. W.; Moossa, A. R.; Wood, R. A. B.; Block, G. E.; Skinner, D. B. (Pritzker Sch. Medicine, Univ. Chicago, 950 E. 59th St., Chicago, IL 60637). *Ann. Surg.* 186(1): 83-87; 1977.

The mechanisms involved in the gastric hypersecretory response to distal small bowel resection were elucidated by studying the secretory profile, serial fasting serum gastrin, and gastric inhibitory polypeptide (GIP) in seven male Rhesus monkeys, with demonstrated gastric hypersecretory response to 50% distal small bowel resection. This increase in gastric acid output had persisted for more than 6 months. Precise, anatomical antrectomy without

vagotomy was performed, and intestinal continuity restored by gastroduodenostomy. Complete abolition of basal acid secretion and of the secretory response to histamine occurred. These effects could not be reversed by continuous (5 hr) infusions of pentagastrin (0.2 μg/kg/hr or 2 μg/kg/hr). The dose response curve to gastrin pentapeptide was altered; maximum secretion was greatly reduced and occurred at 10 μg/kg/hr. Neither basal serum gastrin or basal serum GIP was significantly reduced by antrectomy. These findings indicate that, in this animal model, the antrum is essential in the genesis of the hypersecretory state. If these findings are relevant to man, precise antrectomy may be the procedure of choice for symptomatic acid hypersecretion after small bowel resection or disease.

1816 HISTOCHEMICAL LOCALIZATION OF ENZYMES IN THE NORMAL RAT GASTRIC MUCOSA USING THE TECHNIQUE OF THE SEMIPERMEABLE MEMBRANES AND THE OTHER METHODS. (Eng.) Zaviacic, M.; Brozman, M. (Medical Sch., Komensky Univ. Bratislava, Sasinkova 4, 80100 Bratislava, Czechoslovakia). *Acta Histochem. (Jena)* 57(2):270-281; 1976.

1817 STUDIES ON KINETICS OF ANTRAL AND FUNDIC MUCOSAL CELLS IN MAN WITH DOUBLE LABELLING TECHNIQUE [Abstract]. (Eng.) Santini, D.; Di Febo, G.; Baldi, F.; Salera, M.; Miglioli, M.; Barbara, L. (Cattedra di Gastroenterologia dell'Universita, Bologna, Italy). *Rend. Gastroenterol.* 9(1):81; 1977.

1818 A COMPARATIVE STUDY OF NORMAL AND INTESTINALIZED GASTRIC MUCOSAE AND THEIR SECRETORY PRODUCTS [Abstract]. (Eng.) Schrager, J. (Royal Albert Infirmary, Wigan, England). *Rend. Gastroenterol.* 9(1):73-74; 1977.

1819 PURE HUMAN GASTRIC JUICE: FAILURE OF THE TWO-COMPONENT HYPOTHESIS [Abstract]. (Eng.) Whitfield, P. F.; Hobsley, M. (Middlesex Hosp., Middlesex, England). *Gut* 18(5):A404; 1977.

1820 REGULATION OF GASTRIC MUCUS SECRETION. (Eng.) Vagne, M.; Perret, G. (INSERM U 45, Hopital E. Herriot, 69 Lyon, France). *Scand. J. Gastroenterol.* 11(Suppl. 42):63-74; 1976.

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Mann, N. S. (Veterans Admin. Hosp., Louisville, KY). *Gastroenterology* 72(5, Part 2):1095; 1977.

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1845 ADENYLATE CYCLASE OF HUMAN GASTRIC MUCOSA. STIMULATION BY HISTAMINE AND NON-HORMONAL ACTIVATORS [Abstract]. (Eng.) Simon, B.; Kather, H. (Medizinische Universitatsklinik, Heidelberg, W. Germany). *Acta Endocrinol. (Suppl.) (Kbh.)* 85 (Suppl. 212):196; 1977.

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1847 THE ROLE OF CYCLIC NUCLEOTIDES IN CANINE GASTRIC ACID SECRETION [Abstract]. (Eng.) Thurston, D. (Dept. Medicine, Univ. Illinois, Chicago, IL). *Gastroenterology* 72(5, Part 2):1190; 1977.

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See also, 1698, 1703, 1736, 1764, 1767, 1791, 1851, 1859, 1870, 1989, 1999, 2038, 2124, 2148, 2163, 2164, 2165, 2166, 2172, 2180, 2181, 2188, 2193, 2198, 2199, 2201, 2228.

1849 STUDIES OF THE SECRETORY PROCESS IN THE MAMMALIAN EXOCRINE PANCREAS. I. THE CONDENSING VACUOLES. (Eng.) Novikoff, A. B.; Mori, M.; Quintana, N.; Yam, A. (Albert Einstein Coll. Medicine, Yeshiva Univ., Bronx, NY 10461). *J. Cell Biol.* 75(1):148-165; 1977.

Phosphatase cytochemistry was used to distinguish between the Golgi apparatus and the specialized region of endoplasmic reticulum at the inner (trans) aspect of the Golgi stack known as GERL, in pancreatic exocrine cells of guinea pig, rat, rabbit, and hamster. The trans element of the Golgi stack exhibited thiamine pyrophosphatase (TPPase) but no acid phosphatase (AcPase) activity. In contrast, GERL showed AcPase but no TPPase activity. The nascent secretory granules, or condensing vacuoles, were expanded cisternal portions of GERL. Continuities of condensing vacuoles with rough endoplasmic reticulum are suggested, and it is proposed that some secretory components may have direct access to the condensing vacuoles from endoplasmic reticulum. Connections of Golgi apparatus with GERL were not seen.

1850 INCORPORATION PATTERN OF L-, D-, AND DL-AMINO ACIDS INTO THE PANCREAS OF MICE. (Eng.) Goto, R.; Tezuka, M.; Tamemasa, O. (Shizuoka Coll. Pharmacy, 2-1, Oshika 2-chome, Shizuoka, Japan). *Chem. Pharm. Bull.* 25(7):1574-1581; 1977.

Comparative experiments were made on the *in vivo* incorporation of 18 kinds of ^{14}C-labeled L-amino acid, and of D- and DL-forms of four selected radioactive amino acids into the trichloroacetic acid (TCA)-soluble and protein fractions of the pancreas and liver of dd/Y mice to develop amino acid derivatives as new pancreas-scanning agents. Among the L-forms tested, tryptophan, valine, methionine, and leucine, in this order of decreasing incorporation, showed a relatively high incorporation into the pancreas 30 min after their i.v. injection. The pancreas/liver ratio of the radioactivity of methionine, valine, and leucine determined 15, 30, and 60 min after injection was 6:10. These three amino acids seem to be a possible mother compound for introducing γ-emitters as a pancreas-scanning agent. In the TCA-soluble fraction of the pancreas, the radioactivity of DL- or D-amino acids tested was higher than that of the corresponding L-amino acid. Almost all radioactivity of D-leucine was found in the TCA-soluble fraction. The incorporation of D-leucine into the pancreas was similar to that of L-leucine. These results suggest that γ-radiating derivatives of amino acids might be useful as new pancreas-scanning agents.

1851 IMMUNOHISTOCHEMICAL DEMONSTRATION OF GLUCAGON- AND GLI-CONTAINING CELLS IN THE CANINE GUT AND PANCREAS. (Eng.) Ito, S.; Kobayashi, S. (Niigata Univ. Sch. Medicine, Asahimachidori 1, Niigata, 951 Japan). *Arch. Histol. Jpn.* 39(3):193-202; 1976.

Cells with glucagon- and glucagon-like immunoreactivity (GLI) were studied by an indirect immunofluorescence technique in the normal canine gastrointestinal mucosa and pancreas. Glucagon immunoreactivity was demonstrated in the basal-granulated cells in the deeper portion of the fundic gland of the stomach as well as in the A cells of the pancreatic islet. GLI-positive basal-granulated cells were found in the gastric fundus, jejunum, ileum, and colon. These cells were not found in the pyloric antrum or duodenum. Careful examination of the immunofluorescence specimens indicated that essentially every GLI-positive cell in the gastric fundus and pancreas contained glucagon. The GLI-positive cells in the jejunum, ileum, and colon were the "open" type (i.e., reaching the lumen with their tapered luminal process), whereas the glucagon/GLI-positive cells in the stomach were "closed" (separated from the lumen by a layer of epithelial cells). Basal-granulated cells could receive information for their secretory activity from either the luminal or the serosal side of the gut mucosa.

1852 EFFECT OF ADRENOCORTICOTROPIC HORMONE ON PURE EXOCRINE PANCREATIC SECRETION IN MAN. (Eng.) Gullo, L.; Costa, P. L.; Fontana, G.; Tessari, R.; Serra, D.; Labo, G. (Istituto di Clinica Medica e Gastroenterologia, Ospedale S. Orsola, 40138 Bologna, Italy). *Gastroenterology* 73(4, Part 1):763-764; 1977.

The effect of ACTH on pure exocrine pancreatic secretion was studied in seven patients with external transduodenal drainage of the main pancreatic duct performed after biliary tract surgery. The i.v. injection of ACTH (0.25 mg) during a prolonged i.v. infusion of secretin (0.5 clinical U/kg/hr) plus cholecystokinin (0.5 Ivy dog U/kg/hr) significantly reduced both the concentration and output of lipase (peak -41% and -41%, resp.) and of protein (-39% and -36%, resp.) without affecting volume and bicarbonate secretion. The reduction appeared soon after ACTH injection (peak inhibition in the first 15-min period) and lasted about 75 min. The adrenocortical response to ACTH reached its peak at the 60th min. The mechanism by which the pituitary hormone selectively inhibits pancreatic enzyme secretion without affecting volume and bicarbonate remains to be clarified.

1853 THE DEPENDENCE OF CAERULEIN-EVOKED PANCREATIC FLUID SECRETION ON THE EXTRACELLULAR CALCIUM CONCENTRATION. (Eng.) Ueda, N.;

Petersen, O. H. (Asahikawa Univ. Sch. Medicine, Asahikawa, Hokkaido, Japan). *Pfluegers Arch.* 370 (2):179-183; 1977.

Fluid and amylase secretion was measured in the perfused rat pancreas in the absence of and during cerulein or secretin stimulation. The removal of Ca^{2+} from the perfusion fluid only slightly reduced spontaneous fluid secretion, but caused a marked reduction in the amylase output. In experiments in which the CO_2/HCO_3^- buffer had been replaced by tris buffer, removal of Ca^{2+} abolished spontaneous fluid and amylase secretion. Elimination of Ca^{2+} during continuous stimulation with cerulein (10^{-10} M) caused an immediate rapid reduction in fluid and amylase secretion, which was reversible upon readmission of Ca^{2+}. Removal of perfusion fluid Ca^{2+} and addition of ethylene glycol bis(β-aminoethyl ether)*N,N*-tetraacetic acid during secretin stimulation had no effect on fluid for the first 30 min after the start of Ca^{2+} deprivation. Thereafter, a gradual reduction in fluid flow occurred, which was nonreversible upon Ca^{2+} readmission. During stimulation with monobutyryl cyclic AMP, Ca^{2+}-deprivation failed to reduce fluid secretion within a 30-min period. Increasing the concentration of Ca^{2+} in the perfusion fluid to 20 mM during stimulation with cerulein caused a sharp reduction in fluid secretion and a small decrease in amylase output. These effects were partially reversible if the period of exposure to the high Ca^{2+} concentration was less than 20 min. It is concluded that extracellular Ca^{2+} is important for cerulein-evoked, but not for secretin-evoked, fluid secretion.

1854 EFFECT OF EXTRACELLULAR K^+ CONCENTRATION ON RESTING POTENTIAL, CAERULEIN-INDUCED DEPOLARIZATION AND AMYLASE RELEASE FROM MOUSE PANCREATIC ACINAR CELLS. (Eng.) Poulsen, J. H.; Williams, J. A. (Panum Inst., Univ. Copenhagen, Blegdamsvej 3-C, DK-2200 Copenhagen N, Denmark). *Pfluegers Arch.* 370(2):173-177; 1977.

Studies were carried out to investigate the possible role of stimulation-induced depolarization in pancreatic enzyme secretion. Acinar cell membrane potentials and amylase release were measured from *in vitro* preparations of mouse pancreas. The effect of a 10-fold increase of the extracellular K^+ concentration (to 47 mM) was studied on the resting membrane potential and amylase release, as well as on the membrane depolarization and amylase release induced by cerulein. In the presence of atropine (to exclude the effect of a possible release of endogenous acetylcholine), the increased K^+ concentration depolarized the cells from -45 to -20 mV without influencing the rate of the unstimulated release of amylase. Under these conditions, the depolarizing effect of cerulein was almost abolished, while the cerulein-induced amylase was not. It is concluded that cerulein-induced enzyme secretion from pancreatic acinar cells is independent of the level of the membrane potential, as well as extracellular K^+ concentration, in the range from 4.7 to 47 mM.

1855 SECRETION OF PANCREATIC JUICE IN RESPONSE TO NERVOUS AND HORMONAL STIMULATION IN THE ANAESTHETIZED MONKEY (Erhythrocebus patas AND Papio mandrillus). (Eng.) Vega, D. F.; Martinez-Victoria, E.; Esteller, A.; Murillo, A. (Dept. Animal Physiology, Univ. Granada, Spain). *Comp. Biochem. Physiol.* [*A*] 58(3A):259-264; 1977.

Exocrine pancreatic secretion was studied in two primate species (*Erythrocebus patas* and *Papio mandrillus*). The resting flow in *P. mandrillus* was high (33.0-86.0 µl/min) and contained a low concentration of amylase (2.73-3.43 U/ml). There was no resting secretion in *E. patas*. The i.v. infusion of secretin increased the flow of pancreatic juice in a dose-related manner in both species, the monkeys being highly sensitive to the hormone. In *E. patas*, a single injection or infusions of cholecystokinin-pancreozymin increased the flow and amylase content of the juice. Stimulation of the cervical vagus nerves increased the flow and amylase content of the juice in both species; there were wide differences between individuals of the same species as well as between species. Atropine reduced, but did not abolish the pancreatic response caused by vagal stimulation. In *E. patas*, the concentration of chloride ions fell when the flow of juice increased; in *P. mandrillus* the concentration remained constant at different rates of flow. These experiments show that there may be substantial differences in the properties of the exocrine pancreas between related primate species.

1856 PANCREATIC DUCT CELLS IN RATS: SECRETORY STUDIES IN RESPONSE TO SECRETIN, CHOLECYSTOKININ-PANCREOZYMIN, AND GASTRIN IN VIVO. (Eng.) Folsch, U. R.; Creutzfeldt, W. (Dept. Medicine, Univ. Gottingen, Humboldtallee 1, D-3400 Gottingen, W. Germany). *Gastroenterology* 73(5): 1053-1059; 1977.

The sensitivity and secretory pattern of pancreatic duct cells to a variety of hormones was investigated in male Wistar rats that received a copper-deficient diet supplemented with D-penicillamine (300 mg/kg/day) for 100 days, a regimen that selectively destroys acinar tissue. Resting flow rate of this pancreatic duct model was in the same range as that in the intact gland. The duct cells responded to increasing doses of secretin (2-60 clinical U/kg/hr, i.v.) by producing more juice with increasing outputs of bicarbonate, sodium, potassium, and chloride. Bicarbonate concentration increased with the lowest dose of secretin up to values of 64 mEq/l and did not further increase with higher doses of secretin and increasing secretory rates. The potassium concentration increased with increasing doses of secretin and flow rates, whereas chloride concentration decreased in a reciprocal fashion to bicarbonate. Gastrin (20 µg/kg/hr) and cholecystokinin-pancreozymin (60 Ivy dog U) did not significantly stimulate the duct cells. Atropine (150 µg/kg followed by 150 µg/kg/hr or 250 µg/kg followed by 250 µg/kg/hr) did not inhibit the action of secretin on the flow rate or on bicarbonate secretion.

1857 EFFECTS OF CHOLECYSTOKININ ON ADENYLATE CYCLASE ACTIVITY IN DISPERSED PANCREATIC ACINAR CELLS. (Eng.) Long, B. W.; Gardner, J. D. (Natl. Inst. Arthritis, Metabolism, and Digestive Diseases, Natl. Inst. Health, Bethesda, MD 20014). *Gastroenterology* 73(5):1008-1014; 1977.

Studies were carried out to determine whether the receptor through which cholecystokinin octapeptide (CCK-OP) increases calcium outflux and cellular cyclic guanosine monophosphate (GMP) in intact acinar cells is the same receptor through which CCK-OP increases adenylate cyclase activity in a broken cell system. In addition, the ability of CCK-OP to modify the effect of other peptides on cyclic AMP in intact acinar cells and on adenylate cyclase in homogenates of acinar cells was examined. In dispersed acinar cells prepared from guinea pig pancreas, secretin, and vasoactive intestinal peptide (VIP) but not CCK-OP or [^{32}alanine] (^{32}Ala)-CCK-OP increased cyclic AMP concentration. At concentrations above 10^{-5} M CCK-OP as well as the 32-alanine analogue inhibited noncompetitively the increase in cyclic AMP level caused by secretin or VIP. In homogenates of acinar cells secretin, VIP, and CCK-OP but not [^{32}Ala]CCK-OP increased adenylate cyclase activity. At concentrations below 10^{-5} M, [^{32}Ala]-CCK-OP potentiated the increase in adenylate cyclase activity caused by secretin or VIP. At concentrations above 10^{-5} M, CCK-OP and the 32-alanine analogue inhibited noncompetitively the increase in adenylate cyclase activity caused by secretin and VIP. Analogues and fragments of CCK-OP showed a pattern for increasing adenylate cyclase activity that differed from that for increasing calcium outflux from intact acinar cells. These findings suggest that, in addition to the class of receptors that mediate the effects of CCK-OP on calcium outflux and cyclic GMP, pancreatic acinar cells possess two additional classes of receptors via which CCK-OP alters adenylate cyclase activity. One of these two classes of receptors is accessible only in broken cell preparations and, when occupied by CCK-OP, increases adenylate cyclase activity, whereas, when occupied by the 32-alanine analogue, potentiates the effects of secretin or VIP on adenylate cyclase activity. The other class of receptors is accessible to CCK-OP or [^{32}Ala]CCK-OP in intact cells as well as in homogenates, and, when occupied by either of these two peptides, inhibits the stimulation of adenylate cyclase activity by secretin, VIP, or CCK-OP.

1858 EFFECT OF CHOLECYSTOKININ VARIANT (CCK_{39}) ON DISPERSED ACINAR CELLS FROM GUINEA PIG PANCREAS. (Eng.) Sjodin, L.; Gardner, J. D. (Dept. Pharmacology, Karolinska Institutet S-10401, Stockholm, Sweden). *Gastroenterology* 73(5):1015-1018; 1977.

Dispersed pancreatic acinar cells of male Hartley guinea pigs were used to investigate the effects of cholecystokinin (CCK_{33}) and a peptide termed "cholecystokinin variant" (CCK_{39}) on calcium outflux, cyclic GMP, amylase release, and adenylate cyclase activity, and these effects were compared with those of cholecystokinin octapeptide (CCK-OP). CCK_{39} and CCK_{33} or CCK-OP caused significant increases in the outflux of ^{45}Ca, cyclic GMP, and amylase release. In homogenates of acinar cells, each peptide caused a significant increase in adenylate cyclase activity. For each function tested, CCK_{39} was equipotent with CCK_{33}; CCK_{39} and CCK_{33} were 10 to 30 times less potent than CCK-OP. The efficacies of CCK_{39}, CCK_{33}, and CCK-OP were the same, and none of these effects were altered by a concentration of atropine (10^{-4} M) sufficient to abolish the action of muscarinic cholinergic agents.

1859 SIMULTANEOUS MEASUREMENT OF BASAL PANCREATIC, GASTRIC ACID SECRETION, PLASMA GASTRIN, AND SECRETIN DURING SMOKING. (Eng.) Murthy, S. N. S.; Dinoso, V. P., Jr.; Clearfield, H. R.; Chey, W. Y. (Hahnemann Medical Coll. and Hosp., 230 North Broad St., Philadelphia, PA 19102). *Gastroenterology* 73(4, Part 1):758-761; 1977.

The effect of smoking one unfiltered cigarette every 15 min for 1 hr on basal gastric acid and pancreatic secretion was studied in 10 subjects with a history of duodenal ulcer and 10 without duodenal ulcer. All ulcer patients and five controls were smokers. Smoking induced a transient rise of basal acid output followed by a slight decrease. This effect was more pronounced in the duodenal ulcer group ($p<0.05$). Smoking markedly inhibited fluid and bicarbonate secretion during the smoking period. The bicarbonate and fluid secretion returned to control levels within 30 to 60 min in the ulcer group and in 60 to 90 min in the nonulcer group. There was no difference in the degree of inhibition of pancreatic secretion between the two groups. Immunoreactive gastrin and secretin in the peripheral venous blood did not change significantly during smoking. The degree of inhibition of basal pancreatic secretion correlated well with the plasma concentrations of nicotine; the correlation coefficients at 15, 30, 45, and 60 min during the smoking period were 0.290, 0.864, 0.925, and 0.451, resp. These observations indicate that smoking in the fasting state induces alterations of basal gastric and pancreatic secretions that are not related to changes in plasma gastrin and secretin concentration, but to plasma concentrations of nicotine.

1860 CHARACTERISTICS OF INHIBITION OF PANCREATIC SECRETION BY ISOPROTERENOL. (Eng.) Kelly, G. A.; Rose, R. C.; Nahrwold, D. L. (Milton S. Hershey Medical Center, Hershey, PA 17033). *Surgery* 82(5):680-684; 1977.

The effect of isoproterenol on pancreatic secretion stimulated by the octapeptide of cholecystokinin (OP-CCK) was studied in dogs with gastric and pancreatic fistulas. Special precautions were taken to prevent entry of gastric acid into the duodenum and reflux of duodenal content into the stomach; a balloon seal prevented the entry of gastric contents into the duodenum and reflux of duodenal content into the stomach, and the effec-

tiveness of the seal was confirmed by the injection of phenol red. The i.v. infusion of OP-CCK increased volume and the outputs of bicarbonate and protein from the pancreas. Isoproterenol produced a dose-related inhibition of pancreatic responses to OP-CCK. Propranolol blocked the inhibitory action of isoproterenol completely. Analysis of data by Michaelis-Menten kinetics revealed that there was competitive inhibition of protein output with noncompetitive inhibition of bicarbonate output. The experiments show that isoproterenol inhibits OP-CCK-stimulated pancreatic secretion by a beta-adrenergic mechanism. The kinetic analysis suggests that the intimate mechanisms involved in inhibition of protein and bicarbonate output by isoproterenol are different.

1861 ACTION OF OLEIC ACID ON THE EXOCRINE PANCREATIC SECRETION OF THE CONSCIOUS RAT: EVIDENCE FOR AN ANTI-CHOLECYSTOKININ-PANCREOZYMIN FACTOR. (Eng.) Laugier, R.; Sarles, H. (INSERM U 31, 46 chemin de la Gaye, 13009 Marseille, France). *J. Physiol. (Lond.)* 271(1):81-92; 1977.

The effects of an intraduodenal infusion of oleic acid (2 ml in 60 min) on pancreatic secretion were assessed in conscious rats provided with a new type of duodenal cannula permitting the normal flow of pancreatic juice, but not of bile, between experiments. Intraduodenal oleic acid infusion induced increased water and bicarbonate secretion, which was still significantly above basal values 90 min after the end of the infusion. Protein output increased during the infusion, but protein concentration and output significantly decreased under basal levels 120 min and 150 min after infusion (-63 and -57% of basal values at 150 min, resp.). No inhibition was found when oleic acid was introduced into the cecum or into the first 20 cm of ileum isolated from the rest of small intestine. On the contrary, inhibition of protein secretion was induced immediately by intra-ileal oleic acid infusion. Inhibition of protein secretion secondary to intra-ileal oleic acid infusion was transmitted from a donor rat to a receiver rat by means of a cross-circulation. It is concluded that oleic acid induces an immediate and long lasting increase in water and bicarbonate secretion. During the infusion of oleic acid, protein output is increased, followed by inhibition. This delayed inhibition stems from the second part of the small intestine and was transferred from one rat to another by cross-circulation; it is speculated that oleic acid releases in the conscious rat (from the distal part of the small intestine) a hormonal factor inhibiting pancreatic secretion.

1862 EFFECT OF FASTING AND REFEEDING ON PANCREATIC DNA SYNTHESIS AND CONTENT. (Eng.) Mainz, D. L.; Parks, N. M.; Webster, P. D., III (Veterans Admin. Hosp., Augusta, GA 30904). *Proc. Soc. Exp. Biol. Med.* 156(2):340-344; 1977.

The effects of fasting and refeeding on pancreatic DNA content and rates of [^{14}C]thymidine incorporation into DNA were examined in male Sprague-Dawley rats. After fasting for 2, 4, and 6 days or fasting for 6 days with refeeding for 1, 2, and 3 days, pancreatic weight decreased 8%, 28%, and 43%, resp., and then increased 23%, 12%, and 36%, resp.; DNA content decreased 2%, 9%, and 20%, resp., and then increased 6%, 4%, and 16%, resp. [^{14}C]thymidine incorporation into DNA decreased 40%, 69%, and 86%, resp., and then increased 70%, 267%, and 511%, resp. These studies show the influence of fasting and refeeding on rates of pancreatic DNA synthesis and on DNA content. Control studies demonstrated similar decreases in kidneys, muscle, and spleen. These changes represent complex metabolic adaptive responses to food deprivation. The changes may be mediated in part by lack of substrate but probably also reflect alterations in the hormonal milieu.

1863 EFFECT OF FEEDING SOYBEAN FLOUR CONTAINING DIETS ON THE PROTEIN SYNTHETIC PATTERN OF THE RAT PANCREAS. (Eng.) Dijkhof, J.; Poort, S. R.; Poort, C. (Medical Sch., State Univ., Utrecht, 2501, 22 Nicolaas Beetsstraat, Netherlands). *J. Nutr.* 107(11):1985-1995; 1977.

The influence of p.o.-ingested diets containing raw soybean flour (RSD) as compared to heated soybean flour (HSD) on the *in vitro* synthesis of rat pancreatic secretory proteins was determined using a new method that avoids the determination of enzymic activity. After a 5-day feeding period, half of the pancreas is incubated with [^{3}H]leucine as the precursor, whereas the other half is presented with [^{14}C]leucine. Extracts are prepared from both pancreas halves, mixed, and the extract mixture is subjected to polyacrylamide gel electrophoresis. The ^{3}H/^{14}C ratio of disintegrations/min is determined in each 1-mm slice of the gel. Using this double-label method, it is possible to circumvent the determination of enzymic activity and of specific radioactivity per enzyme. Any change in the rate of synthesis of a protein is recorded as a deviation in the ^{3}H/^{14}C ratio from the total ratio between the two isotopes in trichloroacetic acid-insoluble material. Three amylases, three trypsinogens, two chymotrypsinogens, lipase, ribonuclease, and proelastase were localized in the gel. In RSD-fed rats, all amylase isoenzymes were synthesized at a lower rate than in the HSD-fed rats, whereas the synthesis of two trypsinogens and of one chymotrypsinogen were increased. The synthesis of the second chymotrypsinogen was slightly lowered, and ribonuclease, proelastase, and one trypsinogen were unaffected in their synthetic rates.

1864 RELATIONSHIPS BETWEEN FASTING AND POSTPRANDIAL PANCREATICODUODENAL PRESSURES, PANCREATIC SECRETION, AND DUODENAL VOLUME FLOW IN THE DOG. (Eng.) Owyang, C.; Dozois, R. R.; DiMagno, E. P.; Go, V. L. W. (Mayo Clinic and Mayo Foundation, Rochester, MN 55901). *Gastroenterology* 73(5):1046-1049; 1977.

A canine model that allows simultaneous quantification of pancreatic enzyme outputs, duodenal volume flow, and pancreatic and duodenal pressures under physiological circumstances was developed to determine whether pancreaticoduodenal pressure relationships exist that may permit reflux into the pancreatic duct. Twelve studies on four conscious healthy dogs demonstrated that mean fasting pancreatic pressure was 5 to 10 cm H_2O higher than mean fasting duodenal pressure. Furthermore, 8 min after ingestion of a meal, both the pancreatic and the duodenal pressure increased. Surprisingly, the mean duodenal pressure was higher than the mean pancreatic pressure 20 min after feeding. This relationship lasted for 30 min. Elevation of postprandial pancreatic pressure occurred concomitantly with increased pancreatic enzyme output, and duodenal pressure increased with increased duodenal volume flow. The large postprandial duodenal volume flows associated with duodenal pressures greater than pancreatic duct pressures may favor reflux of duodenal contents into the pancreatic duct. These relationships may be important in the pathogenesis of postprandial pancreatitis and in the induction of pancreatic cancer.

1865 EXPERIMENTAL STUDY ON TRANSDUCTAL DISSEMINATION OF CANCER OF THE PANCREAS. (Eng.) Fujita, N.; Nakase, A. (Kyoto Univ. Medical Sch., Shogoin Kawaramachi 45, Sakyo-ku, Kyoto, 606 Japan). *Gastroenterol. Jpn.* 12(3):224-229; 1977.

The mechanism of transductal dissemination of pancreatic carcinoma was studied in the rabbit by injecting a V_{x2} carcinoma suspension into the pancreatic duct. Ductal occlusion was conducive to implantation and growth in the pancreas of intraductal floating cancer cells, and tumors occurred in all rabbits with occlusion. Tumor growth also occurred in 40% of animals in which the duct was not occluded. Implantation of intraductal floating cancer cells took place by direct embedding into the ductal wall and by leakage of cancer cells from the duct in the process of pancreatic fibrosis due to ductal obstruction. Expansive tumor growth in the pancreas was more vigorous in pancreas with less fibrosis and was most active with concomitant acute pancreatitis or where the pancreas was x-irradiated (1,000-1,250 rads) 1 week before injection of the carcinoma suspension.

1866 STIMULUS-SECRETION COUPLING IN THE EXOCRINE PANCREAS: STUDIES WITH VINBLASTINE, DEUTERIUM OXIDE AND CYTOCHALASIN B [Abstract]. (Eng.) Stock, C.; Launay, J. F.; Bauduin, H.; Grenier, J. F. *Ir. J. Med. Sci.* 146(Suppl. 1):19-20; 1977.

1867 EFFECT OF ENKEPHALIN AND MORPHINE ON HORMONES STIMULATING EXOCRINE PANCREATIC SECRETION [Abstract]. (Eng.) Konturek, S. J.; Tasler, J.; Cieszkowski, M.; Jaworek, J. (Inst. Physiology, Medical Acad., Cracow, Poland). *Ir. J. Med. Sci.* 146(Suppl. 1):14-15; 1977.

1868 PHYSIOLOGICAL ROLE OF PP IN MAN [Abstract]. (Eng.) Bloom, S. R.; Greenberg, G. R.; Adrian, T. E.; Besterman, H. S.; Mallinson, C. N.; McCloy, R. F.; *et al.* (Hammersmith Hosp., London W12, England). *Ir. J. Med. Sci.* 146(Suppl. 1):15; 1977.

1869 PANCREATIC EFFECTS OF A PARTIALLY PURIFIED DUODENAL SOMATOSTATIN-LIKE IMMUNOREACTIVE PEPTIDE (S.L.I.) [Abstract]. (Eng.) Susini, C.; Pradayrol, L.; Bommelaer, G.; Esteve, J. P.; Vaysse, N.; Chayvialle, J. A.; *et al.* (INSERM U 151, Biologie et Pathologie Digestive, Toulouse, France). *Ir. J. Med. Sci.* 146(Suppl. 1):15; 1977.

1870 EFFECTS OF GLI AND PANCREOTONE ON PANCREATIC AND GASTRIC SECRETION [Abstract]. (Eng.) Harper, A. A.; Buchanan, K. D.; Conlon, J. M.; Hood, A. J. C.; Murphy, R. F.; Mushens, J.; Smy, J. R. (Queens's Univ., Belfast, Northern Ireland). *Ir. J. Med. Sci.* 146(Suppl. 1):17; 1977.

1871 THE HUMAN PANCREATIC RESPONSE TO LOW-DOSE SECRETIN STIMULATION [Abstract]. (Eng.) Worning, H.; Fahrenkrug, J.; Schaffalitzky De Mukadell, O. B.; Boolsen, S. W. (Glostrup Hosp., Copenhagen, Denmark). *Ir. J. Med. Sci.* 146(Suppl. 1):17; 1977.

1872 THE ROLE OF CYCLIC NUCLEOTIDES IN EXOCRINE PANCREATIC STIMULUS SECRETION COUPLING [Abstract]. (Eng.) Teufel, H.; Go, K.; Skrampaks, M.; Forell, M. M. (Medizinische Klinik der Universitat Munchen, Munich, W. Germany). *Ir. J. Med. Sci.* 146(Suppl. 1):19; 1977.

1873 MECHANISMS OF INHIBITION OF EXOCRINE PANCREATIC SECRETION BY SOMATOSTATIN IN RATS [Abstract]. (Eng.) Chariot, J.; Roze, C.; Vaille, C.; Debray, C. (Hopital Bichat, 170 Bld. Ney, 75018 Paris, France). *Ir. J. Med. Sci.* 146 (Suppl. 1):21; 1977.

1874 EFFECTS OF CHOLECYSTOKININ AND SOMATOSTATIN ON PANCREATIC ENZYME SECRETION AND TISSUE LEVELS OF CYCLIC GMP AND CYCLIC AMP [Abstract]. (Eng.) Albano, J. D. M.; Bhoola, K. D.; Harvey, R. F. (Univ. Dept. Medicine, Bristol, England). *Ir. J. Med. Sci.* 146(Suppl. 1):21-22; 1977.

1875 THE EFFECT OF PROSTAGLANDINS E2 AND F2α ON PANCREATIC EXOCRINE SECRETION AND BLOOD FLOW [Abstract]. (Eng.) Glazer, G.; Needham, T. N. (St. Mary's Hosp., London W2, England). *Ir. J. Med. Sci.* 146(Suppl. 1):8-9; 1977.

1876 EFFECT OF PLASMA H^+-ION CONCENTRATION ON PANCREATIC BICARBONATE SECRETION:

EVIDENCE SUPPORTING THE PROTON PUMP HYPOTHESIS [Abstract]. (Eng.) Raeder, M.; Mo, A. (Ullevaal Hosp., Oslo, Norway). *Ir. J. Med. Sci.* 146(Suppl. 1):5; 1977.

1877 THE EFFECT OF STIMULATION ON IONIZED CALCIUM CONCENTRATION IN PANCREATIC ACINAR CELLS [Abstract]. (Eng.) Petersen, O. H.; Iwatsuki, N. (Dept. Physiology, Univ. Dundee, Dundee DD1 4HN, Scotland). *Ir. J. Med. Sci.* 146(Suppl. 1):6; 1977.

1878 INHIBITORY ACTION OF HIGH DOSES OF SECRETIN ON PANCREATIC PROTEIN SECRETION IN THE DOG [Abstract]. (Eng.) Devaux, M. A.; Tiscornia, O. M.; Verine, H.; Sarles, H. (Unite 31 INSERM, 46 chemin de la Gaye, 13009, Marseille, France). *Ir. J. Med. Sci.* 146(Suppl. 1):6-7; 1977.

See also, 1736, 1775, 1778, 1791, 1837, 1839, 1986, 1993, 2307, 2463, 2492, 2591, 2607.

SECRETION AND METABOLISM

Hepatobiliary Tract

1879 PREPARATION OF PARENCHYMAL AND NON-PARENCHYMAL CELLS FROM ADULT HUMAN LIVER--MORPHOLOGICAL AND BIOCHEMICAL CHARACTERISTICS. (Eng.) Bojar, H.; Basler, M.; Fuchs, F.; Dreyfurst, R.; Staib, W. (Institut fur Physiologische Chemie II der Universitat Dusseldorf, Moorenstrasse 5, 4000 Dusseldorf, W. Germany). *J. Clin. Chem. Clin. Biochem.* 14(11):527-532; 1976.

A method for the preparation and separation of isolated human liver cells into pure parenchymal and nonparenchymal cell suspensions is described, and the cells are briefly characterized. A mixed suspension of various cell types was obtained by perfusing the isolated human liver with collagenase and hyaluronidase. Pure parenchymal cells are prepared by differential centrifugation, pure nonparenchymal cells by the use of pronase and subsequent isopycnic centrifugation on metrizamide gradients (50-300 g/l). About 90% of the parenchymal and nonparenchymal cells were viable as judged by trypan blue staining. Nonparenchymal cells were not capable of gluconeogenesis but utilized glucose at high rates. Parenchymal cells retained their ability to form glucose and to accumulate glycogen from fructose; glycogen was also synthesized, but to a lesser extent, when lactate or alanine were used as substrate. Studies on binding of ^{125}I-labeled insulin by isolated parenchymal cells were performed at 30 C. The binding data may fit a model with a minimum of two classes of binding sites: (a) high affinity-low capacity sites (dissociation constant [K_d] ~6.6 nM, capacity ~16,000 insulin molecules/cell) and (b) low affinity-high capacity sites (K_d ~0.37 μM, capacity ~646,000 molecules/cell).

1880 THE BILE ACID COMPOSITION OF RABBIT AND CAT GALL-BLADDER BILE. (Eng.) Taylor, W. (Medical Sch., Univ. Newcastle upon Tyne, Newcastle upon Tyne NE1 7RU, England). *J. Steroid Biochem.* 8(10):1077-1084; 1977.

Nonsulfated and sulfated bile acids from gallbladder bile of rabbits and cats were analyzed by gas chromatography-mass spectrometry. In the nonsulfated fraction of rabbit bile, deoxycholic acid was the predominant bile acid. The sulfate fraction (B.A.S.) contained lithocholic acid and small amounts of deoxycholic acid, allodeoxycholic acid, and their 3- and 12-epimers. No sex difference in the composition of rabbit bile was found. The nonsulfated fraction of cat bile contained the normal primary and secondary bile acids, with smaller amounts of other bile acids. The B.A.S. fraction contained isomers of cholic and deoxycholic acids; allodeoxycholic and lithocholic acids predominated. The pattern of bile acids in the B.A.S. fraction of cat bile was much more complex than that of rabbit bile. An important feature of the cat bile B.A.S. fraction was the very small amount of cholic acid present. Male cats produced about twice as much B.A.S. as did female cats, but the females produced more nonsulfated bile acids than the males.

1881 EFFECTS OF CHLORPROMAZINE HYDROCHLORIDE ON BILE FLOW, BILE SALT SYNTHESIS AND BILIARY LIPID SECRETION IN THE PRIMATE. (Eng.) Ros, E.; Small, D. M.; Carey, M. C. *In: Bile Acid Metabolism in Health and Disease. Proceedings of the IV Bile Acid Meeting held at the Hilton Hotel, Basel, Switzerland, October 11-12, 1976.* University Park Press (Baltimore, MD): 219-227; 1977.

The effects of i.v. infusions of chlorpromazine hydrochloride (2.5-10.0 mg/kg) on bile formation were investigated in the bile fistula rhesus monkey during stimulation of the enterohepatic circulation with a constant infusion of [^{14}C]sodium taurocholate. Chlorpromazine reversibly inhibited

bile salt-independent flow and biliary lipid secretion. During cholestasis, extrahepatic retention of bile salt occurred, and endogenous bile salt synthesis was impaired either due to the drug itself or its metabolites or to the retained bile salts. These studies indicate that, in the rhesus monkey, chlorpromazine cholestasis is not prevented by simulation of an intact enterohepatic circulation.

1882 HEPATIC UPTAKE, STORAGE AND BILIARY TRANSPORT MAXIMUM OF BILE ACIDS IN THE DOG. (Eng.) Erlinger, S.; Poupon, R.; Glasinovic, J. C.; Dumont, M. *In: Bile Acid Metabolism in Health and Disease. Proceedings of the IV Bile Acid Meeting held at the Hilton Hotel, Basel, Switzerland, October 11-12, 1976.* University Park Press (Baltimore, MD): 107-112; 1977.

The hepatic uptake of taurocholate was estimated in anesthetized dogs using a multiple-indicator dilution method. The nonlinear increase of the velocity of uptake of taurocholate with the dose was consistent with saturation kinetics. The increase in the half-saturation constant of taurocholate upon the addition of taurochenodeoxycholate was consistent with competitive inhibition of taurocholate uptake by taurochenodeoxycholate. This result suggests the existence of a carrier-mediated transport system for the uptake of bile acids. Intracellular storage and biliary transport maximum were assessed by a multiple-infusion method. A relative storage capacity was measured for both taurocholate and taurochenodeoxycholate, suggesting a storage phenomenon for bile acids. Biliary transport maximum, estimated by the same method, was 6-10 times lower than the maximal initial velocity of uptake. These studies indicate that, in the overall process of hepatic transport, excretion may be the limiting step and intracellular storage may occur.

1883 SEX DIFFERENCES IN SULFATION AND EXCRETION OF 5α-CHOLANOIC ACIDS IN RATS. (Eng.) Eriksson, H.; Taylor, W.; Sjovall, J. *In: Bile Acid Metabolism in Health and Disease. Proceedings of the IV Bile Acid Meeting Held at the Hilton Hotel, Basel, Switzerland, October 11-12, 1976.* University Park Press (Baltimore, MD): 75-81; 1977.

In order to study sex differences in the sulfation and excretion of 5α-cholanoic acids in rats, bile acids in bile from male and female rats were analyzed by ion exchange chromatography and repetitive scan ning gas chromatography-mass spectrometry. Female rats excreted 5 to 10 times more sulfated bile acids than male rats. Most sulfated bile acids had a 5α-configuration and allochenodeoxycholic acid was the major compound, excreted only by female rats. The main part of allochenodeoxycholic acid may arise via microsomal 5α-reduction, whereas dietary cholestanol may be the major precursor of allocholic acid.

1884 EXCRETION OF TAUROCHOLATE FROM ISOLATED HEPATOCYTES. (Eng.) Schwarz, L. R.; Schwenk, M.; Pfaff, E.; Greim, H. (Abteilung fur Toxikologie, Gesellschaft fur Strahlen- und Umweltforschung mbH, Ingolstadter Landstrasse 1, D-8042 Neuherberg, W. Germany). *Eur. J. Biochem.* 71(2):369-373; 1976.

Efflux of taurocholate from isolated rat hepatocytes was studied to characterize the mechanism of bile acid secretion and to investigate whether isolated hepatocytes are suitable to study bile acid secretion. Cells from male Sprague-Dawley rats were incubated with taurocholate for 15 min. The amount of the intracellularly accumulated bile acid was directly related to the concentration in the medium (5-100 μM). Transfer of the loaded cells from the incubation medium to a medium without taurocholate led to taurocholate efflux. Efflux was saturable, and its activation energy amounted to 12 kcal/mol. It was almost completely inhibited by 5 μg/ml antimycin A and by 23% by the uncoupler carbonyl cyanide-*m*-chlorophenylhydrazone (2 μM). Dinitrofluorobenzene and mersalyl, reagents that react with amino acids, inhibited efflux by about 30% when applied at concentrations of 50 μM. Ouabain (1 mM) increased the rate of efflux. The observations indicate that secretory functions are maintained in isolated liver cells.

1885 EFFECTS OF CHOLESTATIC STEROIDS ON UPTAKE AND RELEASE OF TAUROCHOLATE IN ISOLATED HEPATOCYTES. (Eng.) Schwarz, L. R.; Schwenk, M.; Greim, H. *In: Bile Acid Metabolism in Health and Disease. Proceedings of the IV Bile Acid Meeting held at the Hilton Hotel, Basel, Switzerland, October 11-12, 1976.* University Park Press (Baltimore, MD): 145-150; 1977.

Uptake and efflux of taurocholate were studied in isolated liver cells. Both processes were found to be saturable, energy dependent, and susceptible to protein reagents. Norethandrolone (500 μM), 17-β estradiol (50 μM), and progesterone (50 μM) inhibited taurocholate uptake into hepatocytes. Norethandrolone decreased efflux of the bile acid only at the very high concentration of 500 μM. Thus, inhibition of taurocholate uptake may be involved in the pathogenesis of steroid-induced intrahepatic cholestasis

1886 ACCELERATED HEPATIC HAEM CATABOLISM IN THE SELENIUM-DEFICIENT RAT. (Eng.) Burk, R. F.; Correia, M. A. (Univ. Texas Health Science Center, Dallas, TX 75235). *Biochem. J.* 168(1):105-111; 1977.

The heme anabolism and catabolism were studied in phenobarbital-treated, selenium-deficient rats; in addition, apo-(cytochrome P-450) synthesis was investigated in these rats. Hepatic microsomal cytochrome P-450 concentrations were lower in selenium-deficient rats treated with phenobarbital (80 mg/kg, i.p.) for 4 days than in similarly treated controls. No defect in heme synthesis was found on the basis of measurements of δ-aminolevulinate synthase; δ-aminolevulinate dehydratase and

ferrochelatase activities; and urinary excretion of δ-aminolevulinate, porphobilinogen, uroporphyrin, and coproporphyrin. No defect in apo-(cytochrome P-450) synthesis was found by studies of [^{3}H]- and [^{14}C]leucine incorporation into apo-(cytochrome P-450) separated by sodium dodecyl sulfate/polyacrylamide-gel electrophoresis. An increase in heme catabolism was found. An eightfold increase in hepatic microsomal heme oxygenase activity occurred in selenium-deficient rats after phenobarbital treatment, compared with a less than twofold increase in control rats. Breath ^{14}CO excretion after administration of δ-amino[5-^{14}C]levulinate was greater by phenobarbital-treated selenium-deficient rats than by similarly treated controls. These studies demonstrate that the defective induction of cytochrome P-450 by phenobarbital in selenium-deficient rats is accompanied by increased heme catabolism, which could be due to increased breakdown of cytochrome P-450 or to catabolism of heme before it attaches to the apo-cytochrome. The role of selenium in stabilizing cytochrome P-450 and/or in protecting heme from breakdown remains to be determined.

1887 THE TRANSFER OF ESTRONE GLUCURONIDE TO BILE IN AN ISOLATED PERFUSED RAT LIVER SYSTEM. (Eng.) Watanabe, H. (Drug Res. Lab., Ottawa, Ontario K1A OL2, Canada). *Steroids* 29(6): 837-848; 1977.

In an effort to establish a system for the study of biliary estrogen excretion, an isolated rat liver perfusion system was used in a study of the biliary excretion of estrone glucuronide. The estrogen was previously shown to be excreted without prior metabolism. Disappearance from the medium was rapid, and biliary concentrations exceeded that in the medium by more than a 1,000-fold. Disappearance rates were decreased when the estrone glucuronide concentrations in the medium exceeded 0.29 mM. Inhibition by other steroidal conjugates, testosterone glucuronide, 2-methoxyesterone (3-hydroxy-2-methoxy-estra-1,3,5(10)-trien-17-one) glucuronide, and 2-hydroxyestrone (2,3-dihydroxyestra-1,3,5(10)-trien-17-one) glutathione, was also demonstrated. Phenolphthalein glucuronide, at 10 times the molar concentration of estrone glucuronide, did not affect the medium clearance of the latter compound. These findings indicate the possibility of utilizing this system for further studies of possible interactions by other organic compounds for biliary excretion.

1888 REGULATION OF UREA SYNTHESIS IN RAT LIVER. CHANGES OF ORNITHINE AND ACETYLGLUTAMATE CONCENTRATIONS IN THE LIVERS OF RATS SUBJECTED TO DIETARY TRANSITIONS. (Eng.) Saheki, T.; Katsunuma, T.; Sase, M. (Sch. Medicine, Tokai Univ., Bohseidai, Isehara, Kanagawa 259-11, Japan). *J. Biochem. (Tokyo)* 82(2):551-558; 1977.

Regulation of urea synthesis *in vivo* was studied in rats subjected to acute dietary transitions from a 70% to a 5% casein diet or *vice versa*. A 700% increase in urea excretion and a significant increase in urea level in the liver preceded an increase in argininosuccinate synthetase activity when the casein level was increased, and significant decreases in these levels were seen when the casein level was decreased. Immunochemical determination of argininosuccinate synthetase showed that the increase/decrease of the enzyme activity was directly related to the actual increase/decrease of the amount of enzyme protein. The ratios of the initial velocity of urea synthesis from ammonium chloride to the enzymatic activity of argininosuccinate synthetase in the perfused livers were determined. Shortly after the switch of casein diet from 70% to 5%, the ratios decreased to much lower values than those of rats fed on the 5% casein diet for 7 days, while, during the acute transition from 5% to 70% casein diet, the ratios increased above the values of rats fed on the 70% casein diet for 7 days. The concentrations of ornithine and acetylglutamate capable of stimulating urea synthesis changed significantly shortly after the dietary switch. The concentration of ornithine overshot the steady-state level of rats fed on 70% casein after the dietary switch from 5% to 70% casein. Ornithine concentration declined rapidly after the dietary switch from 70% to 5%, falling below the steady-state level of rats fed on the 5% casein diet. Thus, in both cases, new steady-state levels of ornithine concentration were established. The findings that fluctuations of ornithine and acetylglutamate concentration were greater and occurred prior to the activity changes of argininosuccinate synthetase strongly suggest a possible regulatory function of these amino acids in urea synthesis.

1889 OXYGEN GRADIENTS DURING HYPOXIC STEADY STATES IN LIVER. URATE OXIDASE AND CYTOCHROME OXIDASE AS INTRACELLULAR O_2 INDICATORS. (Eng.) Sies, H. (Institut fur Physiologische Chemie, Physikalische Biochemie und Zellbiologie der Universitat Munchen, Goethestrasse 33, D-8000 Munchen 2, W. Germany). *Hoppe Seylers Z. Physiol. Chem.* 358(8):1021-1032; 1977.

Urate oxidase and cytochrome oxidase were assayed in a study of intercellular O_2 gradients in hypoxic steady states in the isolated perfused liver and isolated hepatocytes of male Wistar rats. An O_2 concentration of 1.0 mM in the influent resulted in a cytochrome oxidase reduction of 0% and a 100% rate of urate removal by the liver (274 nmol/min/g liver). Urate removal in the isolated hepatocytes was 528 nmol/min/g hepatocytes. In the hypoxic steady state in the hepatocytes, there was a 90% restriction of urate removal with only a 10% reduction of cytochrome oxidase. These results show a similar dependence of urate oxidase and cytochrome oxidase on O_2 concentration in the perfused liver. The observed differences of O_2 dependence between the intact liver and the isolated hepatocytes suggest that in hypoxic steady states of the intact perfused liver, areas of high and low O_2 concentrations coexist.

1890 RECONSTITUTION OF THE MICROSOMAL ETHANOL-OXIDIZING SYSTEM: QUALITATIVE AND QUANTITATIVE CHANGES OF CYTOCHROME P-450 AFTER CHRONIC ETHANOL CONSUMPTION. (Eng.) Ohnishi, K.; Lieber, C. S. (Bronx Veterans Admin. Hosp., Bronx, NY). *J. Biol. Chem.* 252(20):7124-7131; 1977.

An ethanol-oxidizing system was reconstituted with cytochrome P-450, NADPH-cytochrome c reductase, and phospholipid. This system also metabolized propanol, butanol, and benzphetamine. Chronic ethanol feeding of either male or female rats for 4 to 12 weeks resulted in significant quantitative and qualitative changes in hepatic cytochrome P-450. The absorption maximum of CO-difference spectrum of cytochrome P-450 shifted to higher wavelength. Three hemoproteins were resolved by continuous buffer sodium dodecyl sulfate-polyacrylamide gel electrophoresis of rat liver microsomes. Two of these increased after chronic ethanol feeding. One of these hemoproteins was seen to be distinct from those induced by phenobarbital or 3-methylcholanthrene treatment. On discontinuous buffer sodium dodecyl sulfate-polyacrylamide gel electrophoresis there was a preferential increase of two proteins with apparent molecular weights of 53,400 and 52,000, resp. These two proteins probably represent the apoproteins of the two hemoproteins increased after chronic ethanol feeding. The partially purified cytochrome P-450 from ethanol-fed rats was more active for alcohol (ethanol, propanol, butanol) oxidation than was the control preparation in the presence of excess NADPH-cytochrome c reductase and L-α-dioleoyl lecithin. There was no significant difference in the capacity of partially purified NADPH-cytochrome c reductase from either ethanol-fed rats or controls to promote alcohol oxidation in the presence of cytochrome P-450 and L-α-dioleoyl lecithin. Thus, the adaptive increase of the microsomal ethanol-oxidizing system activity after chronic ethanol consumption can be attributed, at least in part, to quantitative and qualitative changes of cytochrome P-450.

1891 EFFECTS OF PROTEIN DEFICIENCY AND EXCESS ON HEPATIC MIXED FUNCTION OXIDASE ACTIVITY IN GROWING AND ADULT FEMALE RATS. (Eng.) Clinton, S. K.; Truex, C. R.; Visek, W. J. (Sch. Basic Medical Sciences, Univ. Illinois, Urbana, IL 61801). *Nutr. Rep. Int.* 16(4):463-470; 1977.

The effects of protein deficiency and excess on hepatic mixed function oxidase activity were studied in weanling and adult female Sprague-Dawley rats fed diets containing 7.5%, 15%, or 45% protein. Differences in body weight, liver lipids, and liver proteins were observed in rats fed experimental diets for 1 month but not 8 months. Increasing levels of cytochrome P-450, cytochrome b_5, and aniline hydroxylase were observed as dietary protein increased in both weanlings and adults; the cytochrome P-450 levels were 14.0 ± 1.0, 18.0 ± 3.0, and 24.0 ± 3.0 nmol/100 mg protein in rats fed 7.5%, 15%, and 45% protein for 8 months after weaning, resp., and 2.0 ± 0.6, 6.0 ± 0.3, and 9.0 ± 1.4 nmol/100 mg in those fed the respective diets for 1 month after weaning. The respective cytochrome b_5 levels in the rats fed for 8 months were 50.0 ± 4.0, 60.0 ± 10, and 74.0 ± 7 nmol/100 mg protein; in the rats fed for 1 month, the levels were 6.0 ± 1.0, 11.0 ± 1.0, and 17.0 ± 2 nmol/100 mg, resp. The aniline hydroxylase levels were 1.30 ± 0.08, 1.88 ± 0.08, and 2.18 ± 0.17 nmol *p*-aminophenol produced per 20 min/mg microsomal protein in the rats fed for 8 months and 0.45 ± 0.11, 0.66 ± 0.03, and 1.30 ± 0.08 nmol *p*-aminophenol produced per 20 min/mg microsomal protein in those fed for 1 month. The rats were able to compensate for the dietary-induced changes in liver composition and weight gain seen after 1 month; however, differences in mixed function oxidase activity were still evident in adults. The data show that alterations in mixed function oxidase activity are produced by protein excess as well as protein deficiency.

1892 HEPATIC OXIDATIVE DRUG METABOLISM IN RATS WITH EXPERIMENTAL RENAL FAILURE. (Eng.) Van Peer, A. P.; Belpaire, F. M. (Univ. Ghent Medical Sch., De Pintelaan 135, B-9000 Ghent, Belgium). *Arch. Int. Pharmacodyn. Ther.* 228(2):180-183; 1977.

To investigate the shortened half-life of drugs eliminated by the liver that is observed in renal failure in man, the activity of the drug-oxidizing system was studied in liver homogenates from control and uremic rats. Acute renal failure was achieved by ligation of the ureters or by the i.v. injection of urnayl nitrate. In the uremic state, the concentration of cytochrome P-450 and the activity of aniline hydroxylase were not significantly changed, but the activity of aminopyrine *N*-demethylase was significantly decreased (ureter ligation: 34.8 ± 2.6 versus 25.4 ± 2.9 nmol aminopyrine transformed/g liver/min, $p<0.05$; uranyl nitrate injection: 45.1 ± 2.3 versus 34.0 ± 1.8 nmol/g/min, $p<0.01$). In rats the hepatic oxidizing enzymes are not induced by uremia, in contrast to what has been suggested in man.

1893 GLUTATHIONE PEROXIDASE SYSTEM AND MICROSOMAL LIPOPEROXIDATION IN PRENECROTIC STAGES OF DIETARY HEPATIC NECROSIS IN RATS. (Eng.) Porta, E. A.; Ching, B. K. F.; Joun, N. S. (John A. Burns Sch. Medicine, Univ. Hawaii, Honolulu, HI 96822). *J. Nutr.* 107(10):1852-1858; 1977.

The possible relation between the state of the hepatic cytosol glutathione peroxidase (GSH-Px) system (including glutathione reductase, GSH-Rd, and glucose 6-phosphate dehydrogenase, G-6-PD) and hepatic microsomal lipoperoxidation (MLP) was investigated in male Wistar rats. In addition, to study the possible implications of these factors in the development of hepatic necrosis, weanling male rats were fed a basal diet low in Se and vitamin E or were pair-fed with the same diet supplemented with either *dl*-α-tocopherol (3 mg/100 g diet), sodium selenite (0.36 mg/100 g diet), or both. Rats

from the four groups were killed at 9, 20, and 26 days. At the prenecrotic stage, GSH-Px activity in rats fed the basal diet alone was reduced by 97%, and the *in vitro* MLP levels (malonaldehyde) were increased by sevenfold as compared with rats fed the diet supplemented with Se and vitamin E. However, *in vivo* MLP (diene conjugation) was only detected in the liver of one rat that already had foci of necrosis at the time of killing. The decrease in GSH-Px was completely prevented by Se, but vitamin E had no effect. Dietary vitamin E and/or Se had little effect on the activity of GSH-Rd, but both agents, singly or in combination, prevented the reduction of G-6-PD that occurred in rats deficient in vitamin E and Se. The increased *in vitro* MLP was only partially reduced by either Se or vitamin E, since in both cases there still were threefold increases. These results suggest that (a) no clear-cut relation exists between the massive decline of cytosol GSH-Px and the development of hepatic necrosis, (b) the state of GSH-Px is probably unrelated to MLP, and (c) microsomes may not be the initial site of damage.

1894 ISOLATION OF II-ALCOHOL DEHYDROGENASE OF HUMAN LIVER: IS IT A DETERMINANT OF ALCOHOLISM? (Eng.) Li, T. K.; Bosron, W. F.; Dafeldecker, W. P.; Lange, L. G.; Vallee, B. L. (Indiana Univ. Sch. Medicine, Indianapolis, IN 46202). *Proc. Natl. Acad. Sci.* 74(10):4378-4381; 1977.

A functionally distinct, pyrrazole-insensitive form of human liver alcohol dehydrogenase (ADH), designated II-ADH, was isolated from human livers by affinity chromatography on 4-[3-(*N*-6-aminocaproyl) aminopropyl]-pyrazole-Sepharose, and its use as a determinant of alcoholism was investigated. II-ADH was found to be remarkably insensitive (apparent inhibition constant, K_I=500 μM) to pyrazole and its derivatives, which are usually potent ADH inhibitors (K_I=1 μM). This insensitivity of II-ADH to pyrazole inhibition permitted quantitation of its role in hepatic ethanol oxidation. At 5 mM ethanol, a saturating concentration for virtually all other forms of ADH, II-ADH contributed less than 15% to total ethanol oxidation. However, at intoxicating concentrations (60 mM), it accounted for as much as 40% of the total ethanol oxidation rate of liver, indicating a seemingly unique role for this enzyme form in ethanol elimination. The amount of II-ADH was found to vary from liver to liver of individuals and to be considerably more labile than the other molecular forms, phenomena whose inter- or independence requires further study. The isolation of human II-ADH advances efforts to recognize and understand biochemical mechanisms that may be biological determinants of alcoholism and alcohol-related disease states.

1895 TRITIUM EFFECT IN PEROXIDATION OF ETHANOL BY LIVER CATALASE. (Eng.) Damgaard, S. E. (Dept. Biochemistry A, Panum Inst., Univ. Copenhagen, DK-2200 Copenhagen, Denmark). *Biochem. J.* 167(1):77-86; 1977.

The ^3H isotope effect was calculated by the simultaneous determination of the rate of appearance of ^3H in water from [(1*R*-)-1-$^3H_1$]ethanol and the rate of acetaldehyde formation in the presence of rat- or ox liver catalase under conditions of steady-state generation of H_2O_2. The mean value of 2.52 obtained for rat-liver catalase at 37 C and pH 6.3-7.7 was independent of both ethanol concentration and the rate of H_2O_2 generation over a wide range. At 25 C, a slightly lower mean value of 2.40 was obtained with the ox liver catalase. Neither the product, acetaldehyde, nor 4-methylpyrazole influenced the two rates measured in the assay. Relating the value obtained for the ^3H isotope effect to a known value for the ^3H isotope effect strongly supported the view that both values are close to the true isotope effect with the respective substituted compounds on the rate constant in the catalytic step involving scission of the C-H bond. The constancy of the isotope effect under various conditions makes it possible to use it for interpretations *in vivo*. It was established that β-D-galactose dehydrogenase exhibits B-specificity towards the nicotinamide ring in NAD.

1896 EVIDENCE FOR CARBON TETRACHLORIDE- AND ETHANOL-INDUCED LIPID PEROXIDATION IN VIVO DEMONSTRATED BY ETHANE PRODUCTION IN MICE AND RATS. (Eng.) Koster, U.; Albrecht, D.; Kappus, H. (Inst. Toxicology, Univ. Tubingen, D 7400 Tubingen, W. Germany). *Toxicol. Appl. Pharmacol.* 41(3):639-648; 1977.

Experiments were carried out in mice and rats to determine whether carbon tetrachloride or ethanol induces lipid peroxidation. Mice and rats received carbon tetrachloride (1 g/kg) i.p. and were placed in a gas-tight all-glass desiccator connected to a gasometer containing pure oxygen. At different times gas samples from the dessicator were examined for their ethane content. Mice produced about 75 nmol of ethane/kg during 4 hr, whereas rats exhaled 45 nmol/kg during this time period. Control mice and rats produced only small amounts of ethane. Rats pretreated chronically with carbon tetrachloride (0.4 g/kg/day) for 6 weeks produced only about 21 nmol of ethane/kg during the 4 hr following an acute dose of carbon tetrachloride (1 g/kg). After rats were treated with ethanol (5 g/kg), they exhaled about 17 nmol of ethane/kg during 4 hr. The experiments demonstrate that, qualitatively, rats and mice do not differ in ethane production after carbon tetrachloride treatment. However, quantitatively, there are species variations. The results support the suggestion that acute doses of ethanol can induce lipid peroxidation *in vivo*.

1897 URINARY EXCRETION OF ALPHA-FETOPROTEIN IN RATS ON A CIRRHOGENIC CARBON TETRACHLORIDE REGIMEN. (Eng.) Boss, J. H.; Zajicek,

G.; Rosenmann, E. (Hadassah Univ. Hosp., Mount Scopus, Israel). *J. Pathol.* 123(2):85-92; 1977.

The pattern of urinary excretion of alpha-fetoprotein (AFP) in the course of the development of liver cirrhosis induced by carbon tetrachloride was studied in rats, and compared with that in animals maintained on a hepatocarcinogenic regimen (3'methyl-4-dimethylaminoazobenzene, 0.06% in the diet). AFP was detected in the serum and urine of 2- to 9-month-old rats subjected to protracted CCl_4 (0.1 ml/100 g, s.c., twice weekly) poisoning. During the first 3 months of the experiment, urinary excretion of AFP was found in 30-40% of the animals, increasing to 70% thereafter. The liver lesions progressed from acute parenchymal necrosis to cirrhosis, but hepatocellular carcinomas did not develop. Uptake of tritiated thymidine by the hepatocytes increased significantly but was constant throughout the experimental period. In the rats fed the carcinogenic diet, the incidence of AFP excretion decreased from 35% at 4-7 weeks to 20% at 10-16 weeks after beginning the regimen; during the former period, the difference in the incidence of positive urine specimens was significantly different from that in the rats fed the CCl_4-containing diet ($p<0.05$). It may be argued that the failure to induce hepatomas was related to the short timespan of the experiment (too short for tumorigenesis to be manifested). Unfortunately, however, none of the rats survived beyond the 7th month of CCl_4 treatment.

1898 HEPATOTOXIC RESPONSE TO SINGLE OR REPEATED INJECTIONS OF N-NITROSOPYRROLIDINE IN THE RAT. (Eng.) Hendy, R.; Grasso, P. (British Industrial Biological Res. Assoc., Woodmansterne Rd., Carshalton, Surrey SM5 4DS, England). *Chem. Biol. Interact.* 18(3):309-326; 1977.

The acute hepatotoxic effects of *N*-nitrosopyrrolidine (NPY) were studied in Wistar rats. Twenty-four hours after a single NPY dose of 100 mg/kg, centrilobular fatty change and inflammatory cell infiltrate occurred. There was no cell necrosis. Cytochemically, the centrilobular and mid-zonal areas showed autophagy, reduction in lysosomes, and a depression of glucose-6-phosphatase. Less severe changes occurred after a single dose of 30 mg/kg, and there were no detectable alterations after 10 mg/kg. Repeated daily injection of 100 or 30 mg/kg led to megalocytosis of hepatocytes after six doses. Because rats were unable to survive more than 7 NPY doses of 100 mg/kg levels of 30, 10, or 3 mg/kg were administered daily for up to 12 weeks. By 8-12 weeks, most hepatocytes in the centrilobular area were enlarged, and glucose-6-phosphatase activity was low. The lysosomal activity was variable; in some cells it resembled controls, and in others there were few lysosomes scattered haphazardly throughout the hepatocyte. Cells with this low lysosomal activity at 12 weeks generally grouped in island-like areas and ultrastructurally were rich in smooth endoplasmic reticulum. Only marginal changes were observed in rats that received 3 mg/kg throughout this period. PAS-positive, iron-containing pigment filled the Kupffer cells in all rats treated for more than 6 days with 30 mg/kg. The hepatomegalocytes resemble those produced by pyrrolizidine alkaloids, which may imply an antimitotic effect similar to that exerted by NPY on primary rat kidney cells in culture.

1899 THE SYNTHESIS OF TOTAL AND SPECIFIC GLYCOSAMINOGLYCANS DURING DEVELOPMENT OF EXPERIMENTAL LIVER CIRRHOSIS. (Eng.) Gressner, A. M.; Pazen, H.; Greiling, H. (Medical Faculty RWTH, Goethestrasse 27-29, D-51 Aachen, W. Germany). *Experientia* 33(10):1290-1292; 1977.

The synthesis of total and of specific types of glycosaminoglycans (GAG) was studied in explants from chronically injured rat liver at various stages of fibrogenesis. During hepatic fibrogenesis induced by long-term administration of thioacetamide (0.03% in drinking water for 1-7 months), the synthesis of chondroitin 4,6-sulfate was enhanced by 70% and 100% at 1 and 2.5 months, resp., and hyaluronic acid synthesis was increased 5- to 20-fold at various intervals throughout the 7-month period. The formation of heparan sulfate (comprising at least 70% of total liver GAG synthesis) and of a keratan-sulfate-like fraction was stimulated 1.7-fold. The formation of dermatan-sulfate in the liver was not detected. This may be due either to inappropriate conditions used, or it might reflect an exceptional metabolism of this type of GAG. The studies show that the rate of synthesis of individual GAG in normal and diseased liver is very unequal.

1900 PRIMARY BILIARY CIRRHOSIS. STUDY OF THE ACTION OF MITOCHONDRIAL ANTIBODY PLUS COMPLEMENT ON MITOCHONDRIAL MEMBRANE FUNCTIONS. (Eng.) Fernandez-Cruz, E.; Bootello, A.; Blanco, M. F.; Gosalvez, M.; Segovia de Arana, J. M. (Servicio de Immunologia, Clinica Puerta de Hierro, San Martin de Porres, Madrid-35, Spain). *Allergol. Immunopathol. (Madr.)* 4(2):145-152; 1976.

To determine the possible pathogenic role of humoral antibodies reacting with subcellular organ antigens in primary biliary cirrhosis, whole rat liver mitochondria were exposed to mitochondrial antibodies from patients with primary biliary cirrhosis and to antibodies induced in rabbits to rat liver mitochondrial antigens. Mitochondrial respiratory control and oxidative phosphorylation were not significantly altered by incubation of the whole mitochondria with rabbit or human normal or IgG; the results did not change after the addition of complement. Incubation of submitochondrial particle suspensions with normal or immune human or rabbit IgG, using succinate and NADH as substrate, also had no effect on mitochondrial respiration. Again, the addition of complement did not alter the results. ATPase activity and the swelling and contraction of intact mitochondria were not affected by the incubation procedures. The results suggest that

mitochondrial antibodies do not play an important role in the pathogenesis of primary biliary cirrhosis.

1901 INHIBITION OF Na^+, K^+-ADENOSINETRIPHOSPHATASE BY ENDOTOXIN: A POSSIBLE MECHANISM FOR ENDOTOXIN-INDUCED CHOLESTASIS. (Eng.) Utili, R.; Abernathy, C. O.; Zimmerman, H. J. (Clinica delle Malattie Infettive, I Facolta di Medicina, Universita di Napoli, Via Cotugna 1, Napoli 80135, Italy). *J. Infect. Dis.* 136(4):583-587; 1977.

To examine the possibility that the cholestatic effect of *Escherichia coli* or *Salmonella enteritidis* endotoxin might be mediated by the inhibition of the Na^+,K^+-ATPase of the canalicular membrane, the effects of lipopolysaccharides (LPS) of *E. coli* and *S. enteritidis* on the Na^+,K^+-adenosine triphosphatase (ATPase) in canalicular-enriched plasma membranes were examined in the rat liver. At 20 µg/ml, both endotoxins inhibited this enzyme by approximately 40%. Maximal inhibition (70-80%) occurred at concentrations of 120 µg/ml or greater. The LPS of neither organism had any effect on the activity of Mg^{++}-ATPase or 5'-nucleotidase in the same preparations. Inhibition by the *E. coli* LPS appeared to be noncompetitive in nature, and the calculated K_i was 45 µg/ml. Since the Na^+,K^+-ATPase may be responsible for the elaboration of the bile salt-independent fraction, inhibition of this enzyme could be the underlying mechanism for endotoxin-induced cholestasis.

1902 STUDIES ON DRUG-INDUCED CHOLESTASIS: EFFECT OF ETHINYL ESTRADIOL ON HEPATIC BILE ACID RECEPTORS AND (Na^+-K^+)-ATPase. (Eng.) Simon, F. R.; Sutherland, E.; Accatino, L.; Vial, J.; Mills, D. *In: Bile Acid Metabolism in Health and Disease. Proceedings of the IV Bile Acid Meeting held at the Hilton Hotel, Basel, Switzerland, October 11-12, 1976.* University Park Press (Baltimore, MD): 133-143; 1977.

Since ethinyl estradiol administration reduces bile acid transport and bile acid-independent bile flow, the effect of its administration on hepatic ultrastructure, bile acid binding parameters, and the activity of (Na^+-K^+)-ATPase activity was examined. Following administration of ethinyl estradiol (5 mg/kg/day, 5 days), both scanning as well as electron microscopy demonstrated a normal bile canalicular membrane appearance. In addition, the number of sites and dissociation constant for specific binding of [^{14}C]cholic acid to liver surface membranes isolated from ethinyl estradiol-treated rats were unaltered compared to controls. In contrast, (Na^+-K^+)-ATPase was reduced to 46% of the control value, consistent with reduced bile flow (61% of control). Simultaneous administration of phenobarbital (80 mg/kg/day) with ethinyl estradiol prevented reductions in both bile flow and (Na^+-K^+)-ATPase. These studies demonstrate that ethinyl estradiol reduces hepatic (Na^+-K^+)-ATPase activity consistent with its role in regulation of bile salt-independent bile flow. Failure to demonstrate alterations in the initial step in bile acid transport suggest that abnormalities in translocation such as altered ion gradients or changes in the surface membrane lipid environment may be responsible for decreased bile acid transport.

1903 HEPATITIS B e ANTIGEN AND INFECTIVITY OF HEPATITIS B VIRUS. (Eng.) Shikata, T.; Karasawa, T.; Abe, K.; Uzawa, T.; Suzuki, H.; Oda, T.; *et al.* (Nihon Univ. Sch. Medicine, 30 Kamimachi Oyaguchi Itabashi-ku, Tokyo, 173 Japan). *J. Infect. Dis.* 136(4):571-576; 1977.

To confirm the difference in the infectivity of hepatitis B surface antigen (HBsAg)-positive serum according to differences in the e antigen system, four chimpanzees were inoculated i.v. with serum positive for hepatitis B e antigen (HBeAg), and three chimpanzees were inoculated with serum positive for antibody to HBeAg (anti-HBe). Since the infectivity titrations are not yet completed, the end infectivity titer of each serum is not known. All four chimpanzees that received 10^{-1}, 10^{-4}, or 10^{-8} dilutions of HBeAg-positive serum developed hepatitis B virus infection, whereas the one animal injected with undiluted anti-HBe-positive serum became infected, and other chimpanzees injected with diluted anti-HBe-positive sera did not. As judged from the length of the incubation period before appearance of HBsAg in blood, there was a remarkable difference in infectivity between the HBeAg-positive serum and the anti-HBe-positive serum; the former serum was 10^8 times more infectious than the latter. This study confirms the infectivity of HBsAg-positive serum containing anti-HBe and the difference in the infectivity depending upon whether HBeAg or anti-HBe is present.

1904 EARLY EFFECTS OF HYPERVITAMINOSIS A ON GLUCONEOGENIC ACTIVITY AND AMINO ACID METABOLIZING ENZYMES OF RAT LIVER. (Eng.) Dileepan, K. N.; Singh, V. N.; Ramachandran, C. K. (Vallabhbhai Patel Chest Inst., Univ. Delhi, Delhi-110007, India). *J. Nutr.* 107(10):1809-1815; 1977.

The effects of feeding retinyl palmitate to young rats (80-100 g) on the incorporation of ^{14}C-labeled precursors into glucose and glycogen by liver slices, the levels of amino acids in blood and tissues, and the activities of some important amino acid catabolizing enzymes in the liver were investigated. The rats received 30,000 IU of retinyl palmitate daily for 2 days. A stimulation of hepatic gluconeogenesis in hypervitaminosis A was indicated by the increased incorporation of ^{14}C-labeled alanine and bicarbonate into glucose and glycogen by liver slices. Excessive intake of retinol caused a marked increase in the activities of hepatic alanine aminotransferase and ornithine aminotransferase and a decrease in that of tryptophan pyrrolase, without affecting those of tyrosine aminotransferase and serine dehydratase. The ratio of NADH:NAD in the livers of rats fed excess retinol was signif-

icantly increased. The enhancement of gluconeogenesis seen in hypervitaminosis A is caused by a stimulation of gluconeogenic activity of the liver.

1905 EFFECT OF INTERMITTENT PHOTOTHERAPY ON BILIRUBIN DYNAMICS IN GUNN RATS. (Eng.) Vogl, T. P.; Cheskin, H.; Blumenfeld, T. A.; Speck, W. T.; Koenigsberger, M. R. (Box 4, Babies Hosp., 630 W. 168th St., New York, NY 10032). *Pediatr. Res.* 11(10, Part 1):1063-1068; 1977.

To determine whether continuous phototherapy is necessary to control neonatal jaundice, groups of jaundiced (Gunn) rats were exposed to four blue-light regimens: continuous light, 30 min light/30 min dark, 6 min light/6 min dark, and 6 min light/18 min dark. An exponential decrease in serum bilirubin concentration (SBC) was found with all regimens. A logarithmic dose response curve was obtained with a 50% light dose exhibiting 75% efficacy, and a 25% light dose exhibiting 59% efficacy compared to continuous phototherapy. The time constants of the decrease in serum bilirubin concentration also varied logarithmically with doses, with continuous therapy having a time constant of 1.4 days, and 6 min light/18 min dark therapy having a time constant of 3 days. It is concluded that, for adult Gunn rats, and probably for neonates, an optimum combination of light intensity and on/off cycle time exists that represents a therapy regimen that produces optimal therapeutic benefit while minimizing total light dosage.

1906 EFFECT OF RENAL ISCHAEMIA IN RATS WITH OBSTRUCTIVE JAUNDICE. (Eng.) Craddock, G. N.; Lee, E. (Addenbrooke's Hosp., Cambridge, England). *Ann. R. Coll. Surg. Engl.* 59(5):409-414; 1977.

The quantitative relationship between obstructive jaundice and renal susceptibility to ischemia was investigated in female white Wistar rats. The bile ducts of 51 rats were ligated, while those of another 51 were unligated. All animals experienced occlusion of the left kidney one week later for periods of 0-230 min. Three weeks later, the right kidney was removed. Nonjaundiced animals had a mean right kidney weight of 0.394 ± 0.024% of body weight when no left renal ischemia was imposed; the right kidney was 0.519 ± 0.034% of body weight after 230 min of left renal ischemia. Jaundiced rats displayed a mean right kidney weight of 0.470 ± 0.050% of body weight without ischemia and 0.589 ± 0.054% with maximal compensatory hypertrophy. Both jaundiced and nonjaundiced animals had a LD_{50} of renal ischemia of 120 min after delayed opposite nephrectomy. These results show no significant difference between the two groups of animals, except the marked increase in renal weight in the presence of jaundice. No significant difference in susceptibility to renal ischemia could be demonstrated in rats with or without obstructive jaundice.

1907 THE ACCELERATION OF HEPATIC REGENERATION BY PRIOR LAPAROTOMY. (Eng.) Sakamoto, Y.; Jehn, D.; Nicolson, M. O.; Ohashi, E.; Hays, D. M. (Univ. Southern California Sch. Medicine, 4650 Sunset Blvd., Los Angeles, CA 90027). *J. Surg. Res.* 23(5):306-310; 1977.

The effect of laparotomy, carried out as a "stress" procedure, prior to partial hepatectomy on liver regeneration was studied in male Fischer rats. Laparotomy consisted of a 5.5-cm mid-line lower abdominal incision with mobilization of the viscera for 5 min. Laparotomy, carried out 6 hr prior to 68% hepatectomy, accelerated the initial rise and first peak of DNA synthesis by approximately 3 hr and the second peak by approximately 6 hr. The effect was most striking in the 16-hr post-resection liver in which [^{3}H]thymidine incorporation in animals stressed by prior laparotomy was >25 times that found in unstressed animals. These studies suggest that an initial phase of the response to hepatic resection may be initiated by nonspecific trauma that is of sufficient magnitude and administered at an appropriate interval prior to hepatectomy.

1908 GLIAL CHANGES IN PIGS WITH PORTO-CAVAL ANASTOMOSIS AND TEMPORARY OR TOTAL HEPATIC ARTERY CLAMPING. (Eng.) Diemer, N. H.; Tonnesen, K. (Inst. Neuropathology, Univ. Copenhagen, 11 Frederik V's Vej, DK-2100 Copenhagen O, Denmark). *Acta Pathol. Microbiol. Scand.* [*A*] 85(5):721-730; 1977.

To investigate neurological changes in hepatic encephalopathy and in portacaval anastomosis (PCA), the number and size of astrocyte, oligodendrocyte, and neuron nuclei were determined in the cortex and corpus striatum (putamen) of pigs with PCA and total or temporary clamping of the hepatic artery. Animals with PCA and total clamping became comatose and died on average 18.5 hr postoperatively. Their brains showed slight edema but no changes in the glial and neuron nuclear numbers. Animals with PCA and temporary clamping of the hepatic artery (30-60 min) all survived without developing encephalopathy. However, the brains showed vacuolization of the deeper cortical layers, diffuse occurrence of Alzheimer type II astrocytes, and the counts revealed an increased number of astrocytic nuclei. The total number of glial cells decreased due to loss of oligodendrocytes, but the number of neurons was unchanged. The findings indicate that the neuropathological changes after PCA and temporary hepatic artery clamping are concerned primarily with changes of the glial cells.

1909 THE MECHANISM OF POSTSHUNT LIVER FAILURE. (Eng.) Reichle, F. A.; Rao, N. S.; Reichle, R. M.; Chang, K. H. Y. (Temple Univ. Health Sciences Center, Philadelphia, PA 19140). *Surgery* 82(5):738-749; 1977.

To investigate the mechanism of postshunt liver failure, postoperative hepatic mass, body weight, ammonia clearance, hepatic urea cycle enzyme ac-

tivity, and hepatic protein metabolism were determined in 59 dogs that underwent sham operation, end-to-side portacaval shunt, mesocaval shunt with subsequent end-to-side portacaval shunt, distal splenorenal shunt, caval left portal shunt, or portal venous segregation with jugular vein interposition. Compared to total shunt, selective diversion of portal blood from the liver produced less post-shunt liver atrophy, less body weight loss, improved maintenance of urea cycle enzyme activity, improved ammonia tolerance, and less decrease in hepatic DNA, RNA, and protein content. Segregation of left from right hepatic lobes, in relation to portal or systemic venous hepatic perfusion or in relation to gastroduodenopancreaticosplenic or intestinal portal venous drainage, caused little change in enzyme or protein metabolism in respective hepatic lobes.

1910 CHANGES IN THE ACTUAL OXYGEN LEVEL OF THE LIVER DURING BARBITURATE-HALOTHANE ANESTHESIA. (Ger.) Szelenczy, M.; Kiss, T. (Second Surgical Clinic, Pecs Medical Univ., Pecs, Hungary). *Z. Exp. Chir.* 10(3):156-160; 1977.

1911 EVALUATION OF CERTAIN BIOCHEMICAL PARAMETERS IN THE COURSE OF LIVER PERFUSION AT VARYING TEMPERATURES. (Ita.) Motta, G.; Ratto, G. B.; Venturini, M.; De Luca, L.; Bergomi, B.; Nahum, M. (Istituto de Patologia Chirurgica dell' Universita di Genova, Genoa, Italy). *Boll. Soc. Ital. Biol. Sper.* 52(14):1042-1048; 1976.

1912 ANIMAL MODEL FOR THE STUDY OF THE EFFECT OF TOTAL HEPATECTOMY. (Ger.) Klotzer, B.; Staffa, G.; Keitel, R.; Balster, U.; Walter, F. (Chirurgische Klinik der Karl-Marx-Universitat, Liebigstrasse 20, DDR-701 Leipzig, E. Germany). *Z. Exp. Chir.* 10(4):188-191; 1977.

1913 DRUG METABOLISM AND HEPATOTOXICITY. (Fle.) Fevery, J. (Afdeling Lever- en Pancreasziekten, A. Z. St.-Rafael, K. U. Leuven, Louvain, Belgium). *Tijdschr. Gastroenterol.* 20(2):69-99; 1977.

1914 MORPHOLOGICAL INVESTIGATIONS OF THE TOXICITY OF SULFATED AND NONSULFATED LITHOCHOLIC ACID ON PERFUSED RAT LIVER. (Ger.) Leuschner, U.; Czygan, P.; Liersch, M.; Frohling, W.; Stiehl, A. (Medizinische Universitatsklinik, Theodor-Stern-Kai 7, 6000 Frankfort/Main, W. Germany). *Z. Gastroenterol.* 15(4):246-253; 1977.

1915 FORMATION OF SOLUBLE BISMUTH CHOLATES IN THE PRESENCE OF VARIOUS DRUGS AND FOODS. (Fre.) Pellerin, F.; Goulle, J. P.; Dumitrescu, D. (Centre d'Etudes pharmaceutiques de Chatenay-Malabry, 92290 Chatenay-Malabry, France). *Rev. Fr. Gastroenterol.* (128):37-41; 1977.

1916 PERIPHERAL BLOOD STATE IN EXPERIMENTAL ACUTE CHOLECYSTITIS. (Rus.) Chkaidze, O. V.; Japaridze, T. N.; Makharadze, Sh. K.; Tsitskishvili, G. V.; Korpashvili, K. I. (Scientific Res. Inst. Clinical Experimental Surgery, Georgian SSR Ministry Public Health, USSR). *Soobshch. Akad. Nauk. Gruz. SSR* 84(3):741-744; 1976.

1917 ERYTHROPOIETIC PROTOPORPHYRIA. III. EXPERIMENTAL MODEL STUDY OF THE PATHOGENESIS OF THE HEPATIC LESION. (Ger.) Honigsmann, H. (Universitats-Hautklinik, Anichstrasse 35, A-6020 Innsbruck, Austria). *Z. Hautkr.* 52(11):599-621; 1977.

1918 THE EFFECT OF PARENTERAL INJECTION OF A MITOCHONDRIAL SUSPENSION ON THE BIOELECTRICAL PROCESSES IN THE LIVER OF RATS WITH ACUTE TOXIC HEPATITIS. (Rus.) Slepneva, L. V.; Krivoruchko, B. I.; Manoilov, Yu. S. (Lab. Blood Substituents and Blood Preparations, Scientific Res. Inst. Hematology Blood Transfusion, Leningrad, USSR). *Patol. Fiziol. Eksp. Ter.* (4):33-37; 1976.

1919 IN-VITRO ABSORPTION OF BILE SALTS (BS) TO MUCUS IN CYSTIC FIBROSIS (CF) [Abstract]. (Eng.) Dubois, R. S.; Selley, M. L.; Brown, J. M. (Dept. Child Health, Univ. Sydney, Sydney, Australia). *Gastroenterology* 72(5, Part 2):1052; 1977.

1920 BILE ACID PATTERN IN HUMAN AMNIOTIC FLUID: AN INDEX OF MATURITY OF FETAL LIVER [Abstract]. (Eng.) Deleze, G.; Sidiropoulos, D.; Karlaganis, G.; Paumgartner, G. (Dept. Clinical Pharmacology, Univ. Berne, Berne, Switzerland). *Digestion* 14(5/6):460-461; 1976.

1921 RELATIONSHIP AMONG HEPATOTOXICITY, SURFACE PRESSURE AND CELLULAR UPTAKE OF BILE ACIDS [Abstract]. (Eng.) Dujovne, C. A.; Yasuhara, H.; Ueda, I. (Univ. Kansas Medical Center, Kansas City, KS). *Gastroenterology* 72(5, Part 2):1170; 1977.

1922 ASSESSMENT OF THE BILE SALT NON-DEPENDENT FRACTION OF CANALICULAR BILE WATER IN THE RAT [Abstract]. (Eng.) Balabaud, C.; Kron, K. A.; Gumucio, J. J. (Univ. Michigan Medical Sch., Ann Arbor, MI). *Digestion* 15(5):439; 1977.

1923 ABDOMINAL X-IRRADIATION AND BILE ACID CONCENTRATION, COMPOSITION AND KINETICS: STUDIES IN THE RAT [Abstract]. (Eng.) Feldman, E. B.; Moretti-Rojas, I. (Medical Coll. Georgia, Augusta, GA). *Gastroenterology* 72(5, Part 2):1057; 1977.

1924 ULTRASTRUCTURAL CHANGES IN RAT LIVER DURING BILE ACID INDUCED CHOLERESIS [Abstract]. (Eng.) Paumgartner, D.; Paumgartner, G. (Anatom-

isches Institut der Universitat Bern, CH-3000 Bern, Switzerland). *Experientia* 33(6):827; 1977.

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1962 EFFECTS OF OXYGEN ON HEXOBARBITAL SLEEPING TIME IN PHENOBARBITAL AND CARBON TETRACHLORIDE TREATED RATS [Abstract]. (Eng.) Abrams, R. H.; Ashkin, J. R.; Soloway, R. D. (Hosp. Univ. Pennsylvania, Philadelphia, PA). *Gastroenterology* 72(5, Part 2):1176; 1977.

1963 EVIDENCE FOR INCREASED SENSITIVITY OF THE BRAIN TO SEDATIVES IN PORTAL SYSTEMIC ENCEPHALOPATHY: STUDIES IN THE RAT WITH PORTACAVAL ANASTOMOSIS [Abstract]. (Eng.) Bircher, J.; Kupfer, A. (Dept. Clinical Pharmacology, Univ. Berne, Murtenstrasse 35, CH-3010 Berne, Switzerland). *Digestion* 15(5):439-440; 1977.

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SECRETION AND METABOLISM

Intestine

1964 DEVELOPMENT OF SUBSTRATE CYCLE ENZYMES IN THE HAMSTER SMALL INTESTINE. (Eng.) Schiller, C.; Walden, R. (Natl. Inst. Environmental Health Sciences, P.O. Box 12233, Research Triangle Park, NC 27709). *Dev. Biol.* 60(1):130-138; 1977.

The patterns of development of four substrate cycle enzymes, assayed from intestinal tissue subcellular fractions of Syrian fetal, neonatal, and adult LVG/LAK hamsters were studied. NAD-linked L-glycerol-3-phosphate dehydrogenase (NAD-G_3PDH), flavoprotein-linked L-glycerol-3-phosphate dehydrogenase (Fp-G_3PDH) L-malate dehydrogenase (MDH), and GOT were measured in the mitochondria and/or the cytosol by spectrophotometry. Cytosolic NAD-G_3PDH activity increased from low fetal levels (0.0140 ± 0.0021 mmol/min/mg) to a maximum level 7 days after birth (0.1000 ± 0.0428 mmol/min/mg), and then decreased to adult levels (0.0695 ± 0.0053 mmol/min/mg). Mitochondrial Fp-G_3PDH activity increased at 7 days after birth (0.0219 ± 0.0035 mmol/min/mg) to levels slightly lower than those of adults (0.0228 ± 0.0054 mmol/min/mg). MDH in both the cytosol and mitochondrial fractions increased from fetal levels (1.35 ± 0.15 and 3.80 ± 0.45 mmol/min/mg, resp.) comparable to adult levels to a postnatal peak (2.81 ± 0.20 and 6.85 ± 0.74 mmol/min/mg, resp.). GOT activity in both subcellular fractions was high prenatally (0.131 ± 0.015 and 0.558 ± 0.035 mmol/min/mg, resp.), with a postnatal peak at 7 days (0.197 ± 0.028 and 0.459 ± 0.107 mmol/min/mg, resp.), at which time it declined to adult levels (0.121 ± 0.009 and 0.225 ± 0.034 mmol/min/mg, resp.). These results indicate that the 7-day postnatal period represents a peak in mitochondrial and cytosolic enzyme development.

1965 PATHOGENESIS OF MUCOSAL INJURY IN THE BLIND LOOP SYNDROME: BRUSH BORDER ENZYME ACTIVITY AND GLYCOPROTEIN DEGRADATION. (Eng.) Jonas, A.; Flanagan, P. R.; Forstner, G. G. (Hosp. Sick Children, Toronto, Canada). *J. Clin. Invest.* 60(6):1321-1330; 1977.

The effect of surface damage in intestinal bacterial overgrowth on brush border hydrolases and brush border glycoproteins was studied in nonoperated control rats, control rats with surgically introduced jejunal self-emptying blind loops, and rats with surgically introduced jejunal self-filling blind loops. Data were analyzed from blind loop segments, segments above and below the blind loops, and three corresponding segments in the nonoperated controls. Rats with self-filling blind loops had significantly greater fat excretion (6.9 ± 1.3% of intake) than nonoperated controls (2.1 ± 0.3%, $p<0.001$) or controls with self-emptying loops (2.7 ± 0.1%, $p<0.01$) and exhibited significantly lower conjugated:free bile salt ratios in all three segments. Maltase, sucrase, and lactase activities were significantly reduced in homogenates and isolated brush borders from the self-filling blind loop, but alkaline phosphatase was not affected. The relative degradation rate of homogenate and brush border glycoproteins was assessed by a double-isotope

technique involving the injection of D-[6-^{3}H]glucosamine at 3 hr and D-[U-^{14}C]glucosamine at 19 hr before sacrifice and was recorded as a ^{3}H:^{14}C ratio. The relative degradation rate in both homogenate and brush border fractions was significantly greater in most segments from rats with self-filling blind loops. In the upper and blind loop segments from rats with self-filling blind loops, the ^{3}H:^{14}C ratios were higher in the brush border membrane than in the corresponding homogenates, indicating that the increased rates of degradation primarily involve membrane glycoproteins. The incorporation of D-[6-^{3}H]glucosamine by brush border glycoproteins was not reduced in rats with self-filling blind loops, suggesting that glycoprotein synthesis was not affected. Polyacrylamide gel electrophoresis of brush border glycoproteins from the contaminated segments indicated that the large molecular weight glycoproteins, which include many of the surface hydrolases, were degraded most rapidly. Brush border maltase, isolated by immunoprecipitation, had ^{3}H:^{14}C ratios characteristic of the most rapidly degraded glycoproteins. The results indicate that bacteria enhance the destruction of intestinal surface glycoproteins including disaccharidases. Since alkaline phosphatase is not affected, the destruction is selective and presumably involves only the most exposed membrane components.

1966 REGIONAL LOCALIZATION OF ACTIVITY OF Clostridium perfringens TYPE A ENTEROTOXIN IN THE RABBIT ILEUM, JEJUNUM, AND DUODENUM. (Eng.) McDonel, J. L.; Duncan, C. L. (Dept. Microbiology and Cell Biology, Pennsylvania State Univ., University Park, PA 16802). *J. Infect. Dis.* 136(5): 661-666; 1977.

In an effort to characterize and compare the responses of the three parts of the small intestine to *Clostridium perfringens* enterotoxin for future studies on the mode of action of the toxin, rabbit ileal, jejunal, and duodenal loops were exposed to purified enterotoxin from *C. perfringens* type A and then perfused for comparative analysis of the effects of the enterotoxin on each region of the intestine. Ileal loops responded with enhanced net secretion of fluid and sodium, inhibition of chloride and glucose uptake, and substantial sloughing of epithelial cells. The jejunum responded with fluid secretion, enhancement of sodium secretion (only during the first 20 min), inhibition of chloride and glucose uptake, and substantial sloughing of epithelial cells. In the duodenum, transport of fluid, sodium, and chloride was significantly altered only during the first 20 min of perfusion, and significant inhibition of glucose uptake varied from one period to another. Epithelial damage was much less than that seen in the jejunum or ileum. Levels of fluid protein in all three sections corresponded closely to extent of tissue damage. The severity of response to fixed doses of enterotoxin generally varied as follows: ileum>jejunum>duodenum.

1967 A RABBIT MODEL OF DIARRHEA DUE TO INVASIVE Escherichia coli. (Eng.) Cantey, J. R.; O'Hanley, P. D.; Blake, R. K. (Veterans Admin. Hosp., 109 Bee St., Charleston, SC 29403). *J. Infect. Dis.* 136(5):640-648; 1977.

Rabbits received a nonpiliated strain of invasive *Escherichia coli* of human origin (HInvEC) in doses ranging from 1.5 x 10^{8} to 2.5 x 10^{10} bacteria, in an effort to develop a convenient model of *E. coli* (HInvEC) diarrhea. This strain colonized the ileum, cecum, and colon in large numbers for 1-3 days and produced diarrhea in 91 (58%) of the 156 rabbits. A dose of 2.5 x 10^{10} bacteria reliably and repeatedly elicited diarrheal disease in 80% of the animals. The acute pathohistology as determined by light microscopy, transmission electron microscopy, and immune fluorescent microscopy was manifest in the distal ileum, cecum, and colon. Prominent findings included mucosal ulcers, bacterial invasion of the lamina propria, and a polymorphonuclear infiltrate in the lamina propria. Diarrhea due to strain HInvEC was followed by a rise in the titer of serum antibody to O antigen of *E. coli*. Because the rabbit is so well characterized immunologically, this model should be especially valuable in determining the nature of the local immune response and the effects of that response on the infection of the gut by bacteria that cause diarrhea.

1968 REGULATION OF MUCOSAL GROWTH BY GASTRIC AND ILEAL INFUSION OF SINGLE AMINO ACIDS IN PARENTERALLY NOURISHED (TPN) RATS [Abstract]. (Eng.) Spector, M. H.; Traylor, J. B.; Young, E. A.; Weser, E. (Univ. Texas Health Science Center, San Antonio, TX). *Gastroenterology* 72(5, Part 2): 1135; 1977.

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1975 DETERMINATION OF ENTEROPEPTIDASE ACTIVITY IN HUMAN DUODENAL ASPIRATES. (Eng.) Barns, R. J.; Elmslie, R. G. (Queen Elizabeth Hosp., Woodville, South Australia 5011, Australia). *Clin. Chim. Acta* 79(1):55-61; 1977.

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1981 ALTERATIONS IN THE CELL-SURFACE MEMBRANE OF THE INTESTINAL EPITHELIAL CELL DURING MITOSIS AND DIFFERENTIATION, AND AFTER NEOPLASTIC TRANSFORMATION. (Eng.) Weiser, M. M. *In: Membranes and Disease.* Edited by L. Bolis, J. F. Hoffman, and A. Leaf. (New York: Raven Press):281-290; 1976.

1982 THE HANDLING OF H^+ BY THE COLON: THE BIOPHYSICAL ASPECT OF ESOPHAGEAL REPLACEMENT. (Eng.) Chung, R. S. K.; Johnson, G. M.; Denbesten, L. (Veterans Admin. Hosp., Iowa City, IA 52240). *J. Surg. Res.* 22(5):538-544; 1977.

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GENERAL

1983 HISTAMINE H_1- AND H_2-RECEPTOR VASODILATION OF CANINE INTESTINAL CIRCULATION. (Eng.) Pawlik, W.; Tague, L. L.; Tepperman, B. L.; Miller, T. A.; Jacobson, E. D. (Univ. Texas Medical Sch., Houston, TX 77025). *Am. J. Physiol.* 233(3): E219-E224; 1977.

The local vasodilator response to histamine in the superior mesenteric artery of anesthetized dogs was studied to determine whether the mesenteric vasodilator response to histamine is mediated by H_1 receptors alone or whether H_2 receptors are also involved in the response. The vasodilator response to histamine was inhibited by either the H_1-receptor antagonist, tripelennamine, or the H_2-receptor antagonist, metiamide. Both the H_1 agonist, 2-methylhistamine, and the H_2 agonist, 4-methylhistamine, induced dilator responses in the mesenteric circulation. Two temporal patterns of vasodilation were distinguished: a transient spike and subsequent fade of blood flow (seen with either the H_1 agonist or with histamine after H_2-receptor blockade) and a sustained and stable increase in flow (seen with either the H_2 agonist or with histamine after H_1 blockade). Metiamide appeared to be a potent inhibitor of the mesenteric vasodilator response to histamine at least equal to tripelennamine. The results suggest that the mesenteric vasodilator response to histamine is mediated by both H_1 and H_2 receptors.

1984 THE PROTECTIVE EFFECT OF VANCOMYCIN ON CLINDAMYCIN-INDUCED COLITIS IN HAMSTERS.

(Eng.) Browne, R. A.; Fekety, R., Jr.; Silva, J., Jr.; Boyd, D. I.; Work, C. O.; Abrams, G. D. (Dept. Internal Medicine, Univ. Michigan, Ann Arbor, MI 48109). *Johns Hopkins Med. J.* 141(4):183-192; 1977.

To determine whether changes in intestinal flora have a pathogenetic role in clindamycin-associated colitis and are influenced by p.o. nonabsorbable antibiotics, the effect of vancomycin on clindamycin-induced colitis was studied in hamsters. Vancomycin significantly prolonged survival and sometimes prevented death in clindamycin-treated (100 mg/kg, s.c.) hamsters, even if treatment was delayed until 48 hr after clindamycin challenge. Oral vancomycin was more protective than s.c. vancomycin in comparable doses (200 µg/ml in drinking water; 3 mg, s.c.). Vancomycin itself was frequently lethal to hamsters, but the mechanism of toxicity was unclear. Histologic studies demonstrated that vancomycin prevented clindamycin-induced intestinal lesions, although similar lesions frequently evolved after treatment with vancomycin was discontinued. Hamsters given a single injection of clindamycin and subsequently treated with continuous p.o. vancomycin for as long as 12 weeks often died after vancomycin was stopped, with lesions indistinguishable from those seen in clindamycin-induced enterocolitis. Oral vancomycin was not significantly absorbed from the intestinal tract of hamsters. Bacteremia was frequent in clindamycin-treated hamsters in the 72 hr post-challenge, and the incidence of bacteremia was unchanged by p.o. vancomycin. In humans, p.o. vancomycin is nontoxic and may be useful in prevention or treatment of clindamycin-associated colitis.

1985 ELECTROKINETIC PROPERTIES OF LYMPHOCYTES SEPARATED FROM MOUSE PEYER'S PATCHES. (Eng.) Dumont, F.; Robert, F. (Unit Experimental Cancerology and Radiology, INSERM U-95, Plateau de Brabois, 54500 Vandoeuvre-les-Nancy, France). *Immunology* 33(3):295-303; 1977.

The electrophoretic mobility (EPM) of lymphocyte populations isolated from murine Peyer's patches (PP) was characterized to determine whether bone marrow-derived (B) lymphocytes can be distinguished from thymus-derived (T) cells by their lower EPM, as they can in peripheral lymphoid tissues. Electrokinetic properties were investigated using both analytical and preparative cell electrophoresis, and conventional serologic and mitogenic markers for B and T cells were determined in parallel. In CBA mice, PP cells, which included 44% surface-immunoglobulin positive (sIg+) cells and 23% Thy-1-2-positive cells, were found to be composed of two distinct electrophoretic populations. The major one (66% of PP cells) with a mean EPM of 0.70 µm/sec/V/cm was designated as the low-mobility (LM) population, the other one with a mean EPM of 1.16 µm/sec/V/cm was designated as the high-mobility (HM) population. LM cells were encountered in lower frequency (9%) in B lymphocyte-depleted, PP (5% sIg+) from cyclophosphamide-treated CBA mice but were preponderant (92%) in the B lymphocyte-enriched (80% sIg+) nylon-adherent PP cells. In contrast, HM cells made up the majority of cyclophosphamide-resistant PP cells and of nylon-nonadherent PP cells, which were shown to be enriched in T lymphocytes (70 and 63% Thy-1-2$^+$ cells, resp.). On the other hand, following fractionation of CBA PP cells by free-flow preparative electrophoresis, sIg+ cells were distributed in the LM region and Thy-1-2$^+$ cells in the HM region. Moreover, in T lymphocyte-deficient athymic nude mice, PP cells, which were 70% sIg+, were found to be exclusively of LM type (mean EPM=0.77 µm/sec/V/cm). Thus, although both electrophoretic populations included sIg and Thy-1-2-negative elements, it appears that in murine PP as in spleen, most B lymphocytes are endowed with a low EPM and T lymphocytes with a higher EPM.

1986 EN BLOC TRANSPLANTATION OF THE LIVER, PANCREAS, DUODENUM, SPLEEN, AND KIDNEY IN THE RAT. (Eng.) Maki, T.; Sakai, A.; Pettirossi, O.; Kountz, S. L. (Downstate Medical Center, Brooklyn, NY 11203). *Transplantation* 24(4):256-262; 1977.

The fate of the liver, pancreas, duodenum, spleen, and kidneys from (Lewis x Brown Norway)F_1 rats was studied after they were transplanted simultaneously as an *en bloc* graft to Lewis recipients. No immunosuppression was given postoperatively. Serial laparotomies were performed for macroscopic examination and biopsies of the grafts. Macroscopically, the first evidence of rejection was splenic enlargement followed by fatty metamorphotic change of the liver, dilation and loss of peristalsis of the duodenum, and injection and edema of the pancreas. The kidneys maintained normal color and consistency until late in the rejection process. Histological examination suggested that the liver and the spleen may be more vulnerable to immune attack, since in these organs cellular infiltration started earlier and was more extensive in comparison to other organs. While the pancreas exhibited a typical, although somewhat delayed rejection pattern, the kidneys seemed to maintain a well preserved structure. The duodenum showed no significant cellular infiltration throughout the postoperative period of examination, despite severe mucosal destruction. These findings indicate that the five organs are subject to different modes of rejection when transplanted simultaneously as an *en bloc* graft.

1987 GIARDIASIS IN NUDE MICE: CLUES TO BOTH THYMUS-DEPENDENT AND INDEPENDENT HOST DEFENSE MECHANISMS [Abstract]. (Eng.) Stevens, D. P.; Frank, D. M.; Mahmoud, A. A. F. (Dept. Medicine, Case Western Reserve Univ., Cleveland, OH). *Clin. Res.* 25(4):574A; 1977.

1988 EFFECTS OF MARGINAL PROTEIN MALNUTRITION ON PARASITIC INFECTION OF THE INTESTINE [Abstract]. (Eng.) Tomkins, A. M.; Madi, K.; Ogilvie, B. M. (London Sch. Hygiene and Tropical Medicine, London, England). *Gut* 18(11):A970; 1977.

1989 FLUORESCENCE METHODS IN THE STUDY OF THE GASTRIC PARIETAL CELL [Abstract]. (Eng.) Stave, R.; Brandtzaeg, P. (Natl. Hosp. Norway, Oslo, Norway). *Scand. J. Gastroenterol.* 12(Suppl. 45):102; 1977.

1990 SERUM CONCENTRATIONS OF TRIMIPRAMINE (SURMONTIL) AFTER PERORAL ADMINISTRATION IN HEALTHY HUMANS [Abstract]. (Eng.) Myren, J.; Schrumpf, E.; Skaug, O. E.; Bohman, T. (Ulleval Hosp., Oslo 1, Norway). *Scand. J. Gastroenterol.* 12(Suppl. 45):63; 1977.

1991 THE EFFECTS OF ACUTE ALCOHOL ADMINISTRATION ON PLASMA PYRIDOXAL 5'-PHOSPHATE (PLP) [Abstract]. (Eng.) Parker, T. H.; Marshall, J. P.; Roberts, R. K.; Schiff, E. R.; Wilkinson, G. R.; Wang, S.; Schenker, S. (Vanderbilt Univ. Sch. Medicine, Nashville, TN). *Clin. Res.* 25(4):573A; 1977.

1992 BILE ACID, NEUTRAL STEROL, AND FAECAL FAT EXCRETION IN SUBJECTS TREATED WITH FENFLURAMINE [Abstract]. (Eng.) Sian, M. S.; Rains, A. J. H. (Charing Cross Hosp. Medical Sch., London, England). *Gut* 18(11):A951; 1977.

1993 STUDIES ON THE VULNERABILITY OF FAT CELLS BY PANCREATIC LIPASE [Abstract]. (Eng.) Schmitz-Moormann, P. (Dept. Pathology, Univ. Marburg, Marburg, W. Germany). *Scand. J. Gastroenterol.* 11(Suppl. 41):94; 1976.

See also, 1718, 1738, 1779, 1875, 1960, 1972, 1999, 2550, 2579, 2600.

DIAGNOSTIC PROCEDURES

1994 DIAGNOSTIC ACCURACY OF FIBERENDOSCOPY IN THE DETECTION OF UPPER INTESTINAL MALIGNANCY. A FOLLOW-UP ANALYSIS. (Eng.) Dekker, W.; Tytgat, G. N. (St. Elisabeth's of Groote Gasthuis, Boerhaavelaan 22, Haarlem, Netherlands). *Gastroenterology* 73(4, Part 1):710-714; 1977.

The accuracy of fiberendoscopy with directed biopsy in the detection of upper intestinal malignancies has been evaluated by studying the operative or postmortem findings or the clinical follow-up data after at least 1 yr and, for relevant lesions, after 2 or 3 yr, in 990 patients. There were no false-positive diagnoses of malignancy in the 167 patients diagnosed fiberendoscopically to harbor an upper intestinal malignancy, and only 2 false-negative diagnoses in the 829 patients with either a benign lesion or an endoscopically normal mucosa. Seven of the 135 adenocarcinomas of the stomach turned out to be early gastric cancers. The two missed malignancies were interpreted initially as benign gastric ulcers. The over-all endoscopic-bioptic accuracy rate calculated for all patients amounts to 99.8%. Such a high accuracy rate can only be reached provided high numbers of biopsies are taken, and particularly at least 10 of gastric ulcers and of suspicious lesions. Endoscopy alone is not sufficiently reliable in determining the nature of the lesion; an incorrect endoscopic interpretation was made in 7.3% of the ulcerous lesions, and in 8.2% of them no firm conclusion could be reached.

1995 APPRAISAL OF THE ^{14}C-GLYCOCHOLATE ACID TEST WITH SPECIAL REFERENCE TO THE MEASUREMENT OF FAECAL ^{14}C EXCRETION. (Eng.) Scarpello, J. H. B.; Sladen, G. E. (Royal Hosp., West St., Sheffield, England). *Gut* 18(9):742-748; 1977.

The ^{14}C-glycocholate test, including the measurement of marker-corrected fecal ^{14}C, was assessed in 18 normal controls, 21 patients with diarrhea not attributable to altered bile acid metabolism, 12 patients with diverticula of the small intestine, 34 patients with previous resection of ileum and often proximal colon, and 10 established ileostomists. Patients with diverticular disease had increased breath $^{14}CO_2$ excretion, but normal fecal excretion of ^{14}C, and this test was more frequently abnormal than the Schilling test. Ileostomists excreted increased amounts of fecal ^{14}C, even when the ileum was intact and apparently normal. The pattern after resection was complex. Breath ^{14}C output was normal if the ileal resection was less than 25 cm in length, although some of these patients had increased fecal ^{14}C excretion if, in addition, at least 15 cm of proximal colon had been resected or bypassed. Longer ileal resections were associated with increased breath and/or fecal ^{14}C excretion, depending in part on the length of colon resected or bypassed and the 24-hr fecal volume. Fewer than half these patients had both increased breath and fecal excretion of isotope, and fecal ^{14}C alone was occasionally normal with an ileal resection of 50 cm or more. The ^{14}C-glycocholate test was more frequently abnormal than the Schilling test in this group. The use of fecal marker correction had only a minor impact on the results. These data suggest that, in patients with ileal resection, fecal ^{14}C, like fecal weight, is determined by the extent of colonic resection as well as by the amount of ileum resected.

1996 URINARY OXALATE ON A HIGH-OXALATE DIET AS A CLINICAL TEST OF MALABSORPTION. (Eng.) Andersson, H.; Gillberg, R. (Sahlgren's Hosp., S-413 45 Gothenburg, Sweden). *Lancet* 2(8040):677-679; 1977.

To investigate whether the determination of urinary oxalate can replace the determination of fecal fat as a clinical test of malabsorption, 100 g of spinach a day was added to the hospital diet of 54 patients with suspected malabsorption. Hyperoxaluria was found in 38 patients; all of them had steatorrhea. No patient with steatorrhea had a urinary oxalate excretion of <40 mg/day. Ten other patients had hyperoxaluria, but the fecal fat determinations were regarded as unreliable in almost all and malabsorption could not be confirmed. In clinical practice, the determination of urinary oxalate after a p.o. load of oxalate could replace fecal fat determination in most patients with suspected malabsorption.

1997 PURIFIED ANTIGEN RADIOIMMUNOASSAY IN SEROLOGICAL DIAGNOSIS OF SCHISTOSOMIASIS MANSONI. (Eng.) Pelley, R. P.; Warren, K. S.; Jordan, P. (Case Western Reserve Univ., Cleveland, OH 44106). *Lancet* 2(8042):781-785; 1977.

A radioimmunoassay was developed for detecting human schistosomiasis with a highly purified *Schistosoma mansoni* egg antigen labeled with ^{125}I. With this assay, 276 sera from two patient populations from St. Lucia and Kenya were analyzed, and the results were compared with those previously obtained by the standard assays on the same St. Lucian sera. The egg antigen, major serologic antigen (MSA_1), has striking immunochemical and species specificity and appears to be the principal antigen responsible for the granulomatous response to *S. mansoni* eggs. This ^{125}I-antigen was tested with 5 µl of patient serum as a potential serodiagnostic test for schistosomiasis. Ninety-two control sera from uninfected St. Vincentian patients were seronegative. In studies on 135 mildly infected St. Lucians, the 5-µl serum ^{125}I-MSA_1 serodiagnostic test was more sensitive than any tests available at the Center for Disease Control, with 64% of infected children, 83% of adolescents, and 98% of adults being positive. Forty-nine heavily infected Kenyans of all age groups were uniformly (100%) seropositive. Finally, a semiquantitative version of the ^{125}I-MSA_1 radioimmunoassay that uses 0.5 µl of patient sera demonstrated quantitatively significant differences among age-matched and intensity-matched groups of patients with *S. mansoni*, *S. haematobium*, and *S. japonicum* infections. The highly sensitive complement-fixation and indirect-immunofluorescence tests have completely failed to differentiate *S. mansoni* from *S. haematobium* infections.

1998 ARTERIOGRAPHY IN PERITONITIS AND ILEUS. (Ger.) Levendjuk, A. M. (Res. Inst. General Emergency Surgery, 19, Vjezd Balakireva 1, Kharkov, USSR). *Radiol. Diagn.* 18(2):195-203; 1977.

Arteriographic changes caused by peritonitis (induced by ligation of the vermiform appendix) and ileus (induced by obturation or strangulation of the intestine) were studied in 100 adult dogs. Angiography revealed considerable changes in the local blood circulation (reduction of the linear velocity and of the flow volume) in experimental peritonitis and ileus. Constriction of the arteries was a common feature of peritonitis and ileus. The regional hemodynamic changes were most consistently pronounced in ileus caused by strangulation; the changes increased gradually in ileus caused by obturation, after which they showed a tendency toward normalization. In peritonitis, the disturbances in blood circulation were aggravated in parallel with the course of the disease; the blood flow volume dropped to a very low level at the terminal stage of peritonitis.

1999 A NON-INVASIVE TEST OF GASTRIC FUNCTION. (Eng.) Taylor, T. V.; Bone, D.; Torrance, B. (Royal Infirmary, Edinburgh, Scotland). *Br. J. Surg.* 64(10):702-708; 1977.

The results of a new, noninvasive test of gastric secretory function using ^{99m}Tc-pertechnetate are presented. Fifteen minutes after the administration of pentagastrin (6 μg/kg, i.m.) to fasted patients, ^{99m}Tc (1 mCi, i.v.) is administered, and dynamic images produced by a gamma camera are taken at 2, 10, 15, and 30 min. In a normal subject, 5.8% of the injected dose was inside the stomach after 30 min, and a clear gastric image was obtained. Scans of a patient who had undergone total gastrectomy revealed no image formed, no appreciable fall off of background activity, and zero intragastric activity. With pernicious anemia, a poor gastric outline was present, with only 1% activity recorded after 30 min. Patients with stomach fundus carcinoma showed gastric activity of 1.8% of the total dose after 30 min. A mean activity of 7.4 ± 2.5% of the dose was recorded for patients with duodenal ulcers ($p < 0.05$). A false-negative scan was obtained from a patient with dermatitis herpetiformis and celiac disease. Although these findings are preliminary, this appears to be a convenient, noninvasive technique for assaying gastric function proportional to acid output without losses due to incomplete aspiration or gastric emptying.

2000 A REAPPRAISAL OF CLINICAL, ROENTGENOGRAPHIC AND ENDOSCOPIC FEATURES OF THE ZOLLINGER-ELLISON SYNDROME. (Eng.) Regan, P. T.; Malagelada, J. R. (Mayo Clinic, Rochester, MN). *Mayo Clin. Proc.* 53(1):19-23; 1978.

The clinical, roentgenographic, and endoscopic features of 40 patients with Zollinger-Ellison syndrome were evaluated in an attempt to update the diagnostic criteria of this entity. The patient group (26 without prior gastric surgery, 9 with vagotomy and partial gastrectomy, 2 with partial gastrectomy, and 3 with vagotomy and pyloroplasty) exhibited at least two of the following three criteria: (1) hypergastrinemia (gastrin serum levels >300 pg/ml), (2) gastric hypersecretion (basal acid output >15 mEq in previously unoperated patients, >5 mEq in patients with prior gastric surgery), or (3) histopathologic demonstration of an endocrine-type tumor at operation. Sixty percent of the patients were men, and the mean age was 50.5 yr. The mean duration of gastrointestinal symptoms (abdominal pain, diarrhea, or bleeding) prior to diagnosis was 77.9 months. In one-half of the patients with Zollinger-Ellison syndrome, the clinical, roentgenographic, and endoscopic findings were similar to those indicating duodenal ulcer or erosive duodenitis. In conclusion, along with clinical, roentgenographic, and endoscopic studies, routine diagnostic use of serum gastrin radioimmunoassay and gastric analysis is suggested for a more efficient diagnosis of this syndrome.

2001 COMPARISON OF ULTRASOUND AND COMPUTER-ASSISTED TOMOGRAPHY IN PANCREATIC DIAGNOSIS. (Eng.) Husband, J. E.; Meire, H. B.; Kreel, L. (Royal Marsden Hosp., Downs Rd., Sutton, Surrey, SM2 5PT, England). *Br. J. Radiol.* 50(600): 855-862; 1977.

In 50 patients with suspected pancreatic disease, both ultrasonography and computerized tomography (CT) were performed to confirm the diagnosis. A grey scale ultrasound machine and the prototype of the EMI whole-body scanner were used. Both investigations were carried out on the same day in each patient. The final diagnosis was obtained either by laparotomy, by post mortem, or by strong biochemical or clinical evidence. CT visualized the pancreas in 100% of the patients, whereas ultrasound was successful in 80%. The ultrasound failures were due to bowel gases anterior to the pancreas. The diagnosis in normal patients was correct in 12 of 14 patients when ultrasound examination was performed and in 11 patients using CT. Acute pancreatitis was successfully diagnosed by ultrasonography in six of eight patients. Chronic pancreatitis was correctly diagnosed in eight patients (50%) using ultrasound, while CT demonstrated the disease in 14 of 16 patients. Ultrasound diagnosed only five of nine cases of carcinoma, while CT correctly diagnosed all carcinomas. Both techniques failed to detect lesions in either of two patients with endocrine tumors. Both ultrasonography and CT correctly diagnosed pancreatic lymphoma in one patient with this tumor. If both techniques are available, ultrasound may be used as a screening procedure from which about 15% of patients may be referred for other diagnostic procedures, including CT.

2002 PREOPERATIVE DIAGNOSIS OF PANCREATIC CARCINOMA BY PERCUTANEOUS ASPIRATION BIOPSY. (Eng.) Goldman, M. L.; Naib, Z. M.; Galambos, J. T.; Rude, J. C., III; Oen, K. T.; Bradley, E. L.,

III; *et al.* (Grady Memorial Hosp., 80 Butler St., S.E., Atlanta, GA 30303). *Am. J. Dig. Dis.* 22 (12):1076-1082; 1977.

Percutaneous aspiration biopsy was used in the preoperative differential diagnosis of pancreatic carcinoma and pancreatitis in 13 patients with suspected pancreatic malignancies. The pancreatic cancer was localized for aspiration biopsy by the combination of ultrasonography and angiography or cholangiography. The skin directly overlying the main portion of the pancreatic mass (as determined by ultrasonography) was punctured with a Chiba needle, and under fluoroscopic guidance, the needle was directed to the region of abnormal vessels seen by angiography. In all of the 13 aspirations that were performed, recognizable pancreatic glandular and duct cells were obtained. Carcinoma of the pancreas was documented by angiography, clinical follow-up, or by histology in 11 patients. In six of these patients, adenocarcinoma was confirmed. In a seventh patient, the cytological material was suspicious of cancer. One positive finding was from a patient with a small tumor less than 3 cm in diameter localized in the head of the pancreas. The other positive findings were from patients with tumors ranging in diameter from 3 to over 6 cm. In the four patients in whom aspiration biopsy was not diagnostic, the carcinoma was large in one, moderate in one, and small in two. Following percutaneous aspiration biopsy, none of the 13 patients had clinical or laboratory evidence of pancreatitis or worsening of their clinical condition. Percutaneous aspiration biopsy appears to be a safe procedure that should be considered in the evaluation of patients with suspected pancreatic malignancy in which a mass lesion is demonstrated by ultrasonography, computerized tomography, angiography, or retrograde pancreatography.

2003 DUODENOSCOPIC GUIDED BIOPSY OF THE BILIARY AND PANCREATIC DUCT. (Eng.) Seifert, E.; Urakami, Y.; Elster, K. (1. Med. Klinik, Stadt. Krankenhaus Kemperhof, D-5400 Koblenz, W. Germany). *Endoscopy* 9(3):154-161; 1977.

A specially designed forceps was used to perform duodenoscopic guided biopsy of the biliary and pancreatic duct in 11 patients. The special forceps, which has a tip that can be bent like an ordinary intubation cannula, was inserted via the instrumentation channel of the duodenofiberscope into the papilla of Vater and was guided to the lesion by fluoroscopy. When the lesion was reached, the biopsy was taken in the usual way. The method was used to gain histological material in 10 of the 11 patients examined. In one case, the forceps could not be inserted into the papilla. The method gave good and representative results in the biliary duct and from the papilla. Biopsies taken from inside of carcinomatous papillae gave, in both cases, positive results; also, a case of adenomyomatosis of the papilla of Vater was confirmed histologically. The technique also allowed for the differentiation of a gallstone in the cystic duct from a possible tumorous lesion. In the pancreatic duct, however, the guided biopsy technique did not aid in the differential diagnosis of benign or malignant lesions. In three out of four cases of verified pancreatic cancer, the histological diagnosis was false-negative, probably because the tumor mass was not reached. An advantage of the guided biopsy over cytological examination is that the intraluminal forceps can biopsy lesions involving infiltration of the deeper layers of the lumen wall or superficial spreading over the surface of the ducts; the criteria of malignancy rest on the manner of proliferation rather than on the nature of the individual cell. The biopsy specimens are very small and need an exact preparation. Orientation of the specimen in the paraffin block and the direction of section are critical factors for proper evaluation, as is a knowledge of the exact location from which the specimen was obtained.

2004 LIVER STUDIES WITH RADIOISOTOPES. (Eng.) Dugdale, L. M. (Alfred Hosp., Melbourne, Australia). *Aust. Radiol.* 20(4):391-400; 1976.

2005 SCINTIGRAPHIC EVALUATION OF LIVER SIZE IN CHILDREN AND ADULTS [Abstract]. (Eng.) Kahn, A.; Piepsz, A. (No affiliation given). *Acta Paediatr. Belg.* 29(2):125; 1976.

2006 COMPUTER DISPLAY AND ANALYSIS OF LIVER GAMMA CAMERA SCANS [Abstract]. (Eng.) Rai, G. S.; Haggith, J. W.; Fenwick, J.; James, O. (Dept. Medical Physics, Univ. Newcastle upon Tyne, Newcastle upon Tyne, England). *Gastroenterology* 72(5, Part 2):1115; 1977.

2007 NUCLIDE SCANNING, ULTRASONOGRAPHY AND LIVER BIOPSY IN THE DIAGNOSIS OF HEPATIC TUMOURS: A COMPARATIVE EVALUATION OF THE AVAILABLE TECHNIQUES. (Eng.) Conn, H. O. (No affiliation given). *Clin. Gastroenterol.* 5(3):665-680; 1976.

2008 PERITONEOSCOPY FOR THE DIAGNOSIS OF PREDOMINANTLY LEFT LOBE LESIONS OF THE LIVER [Abstract]. (Eng.) Whitcomb, F. F.; Gibb, S. P. (Lahey Clinic Foundation, Boston, MA). *Gastroenterology* 72(5, Part 2):1149; 1977.

2009 AMINOPYRINE BREATH TEST DURING ALCOHOL INTOXICATION [Abstract]. (Eng.) Audetat, V.; Preisig, R.; Kupfer, A.; Bircher, J. (Dept. Clinical Pharmacology, Univ. Berne, Berne, Switzerland). *Digestion* 14(5/6):495; 1976.

2010 DETERMINATION OF ENZYMATIC ACTIVITY OF GUANASE AND GAMA-GLUTAMYL TRANSPEPTIDASE IN ACUTE AND CHRONIC LIVER DISEASES: COMPARISON WITH OTHER BIOCHEMICAL PARAMETERS OF FUNCTIONAL HEPATIC EVALUATION. (Por.) Saez-Alquezar, A.; Chamone, D. de A.F.; Ohtsuki, N.; Magnanelli, A. C.; Mies, S.; Raia, A.; *et al.* (Faculdade de Medicina da Universidade de Sao Paulo, Sao Paulo, Brasil). *Arq. Gastroenterol.* 13(3):159-167; 1976.

2011 A RADIOCHROMATOGRAPHIC METHOD FOR BILIARY CONTRAST AGENT METABOLITES. (Eng.) Varga, D. (Dept. Surgery, Sydney Univ., Sydney, Australia). *Aust. Radiol.* 20(4):401-405; 1976.

2012 HEPATIC NECROSIS AFTER INTRAVENOUS CHOLANGIOGRAPHY WITH IOGLYCAMATE [Abstract]. (Eng.) Winckler, K. (Dept. Internal Medicine, Univ. Gottingen, Gottingen, W. Germany). *Digestion* 14(5/6):555; 1976.

2013 ERCP AND FINE NEEDLE PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY IN THE DIAGNOSIS OF BILIARY TRACT DISEASE [Abstract]. (Eng.) Benjamin, I. S.; Allison, M. E. M.; Moule, B.; Blumgart, L. H. (Royal Infirmary, Glasgow, Scotland). *Gut* 18(5):A416; 1977.

2014 TRANSHEPATIC PERCUTANEOUS CHOLANGIOGRAPHY. (Eng.) Buonocore, E. (Univ. Tennessee Hosp., Knoxville, TN). *Radiol. Clin. North Am.* 14(3):527-542; 1976.

2015 RADIOLOGY OF THE PANCREAS, 1976. SONOGRAPHY AND DUCTOGRAPHY. (Eng.) Ferrucci, J. T., Jr. (Massachusetts General Hosp., Boston, MA 02114). *Radiol. Clin. North Am.* 14(3): 543-562; 1976.

2016 CARCINOMA OF THE PANCREAS--DEFINITE DIAGNOSIS BY MODIFIED DUODENAL DRAINAGE [Abstract]. (Eng.) Iswara, K.; Alderete, M.; Kodsi, B.; Lui, F. (Maimonides Medical Center, Brooklyn, NY). *Gastroenterology* 72(5, Part 2):1075; 1977.

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2019 ECHOTOMOGRAPHIC DIAGNOSIS OF TUMORS IN THE CORPOREOCAUDAL PARTS OF THE PANCREAS [Abstract]. (Eng.) Pietri, H.; Rosello, R.; Aimino, R.; Serafino, X.; Paoli, J. (I. Calmettes Inst., Marseille, France). *Scand. J. Gastroenterol.* 11(Suppl. 41):90; 1976.

2020 DIAGNOSTIC VALUE OF THE PROVOCATIVE TEST WITH SECRETIN AND CHOLECYSTOKININ/PANCREOZYMIN [Abstract]. (Eng.) Otte, M.; Thurmayr, R.; Thurmayr, G. R.; Forell, M. M. (II. Medizinische Klinik der Universitat Munchen, Munchen, W. Germany). *Scand. J. Gastroenterol.* 11(Suppl. 41): 88; 1976.

2021 THE PRESENT STATUS OF CARCINOEMBRYONIC ANTIGEN (CEA) IN DIAGNOSIS, DETECTION OF RECURRENCE, PROGNOSIS AND EVALUATION OF THERAPY OF COLONIC AND PANCREATIC CANCER. (Eng.) Zamcheck, N. (No affiliation given). *Clin. Gastroenterol.* 5(3):625-638; 1976.

2022 DIAGNOSTIC POSSIBILITIES OF SCINTIPHOTOGRAPHY IN PATIENTS WITH OBSTRUCTIVE JAUNDICE. (Rus.) Kasatkin, Yu. N.; Rozanov, I. B.; Mironov, S. P.; Diasamidze, Z. I.; Matveev, V. I.; Yakushin, V. I.; Khromenkov, V. I. (Dept. Medical Radiology, Central Postgraduate Medical Inst., Moscow, USSR). *Khirurgiia (Mosk.)* (7):63-67; 1977.

2023 ROLE OF PUNCTURE BIOPSY IN THE STUDY OF MORPHOLOGICAL CHANGES IN THE PANCREAS. (Rus.) Tsoy, G. V.; Struzhko, K. G.; Makarova, K. A.; Grigorevsky, V. P. (Dept. Clinical Surgery, Tselinograd Medical Inst., Tselinograd, USSR). *Khirurgiia (Mosk.)* (7):113-116; 1977.

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2026 THE HEMAGGLUTINATION TEST USING FORMALINIZED RED BLOOD CELLS IN THE DIAGNOSIS OF HYDATIDOSIS. (Spa.) de la Maza, D.; Biel de la M., F.; Contreras, M. (Departamento de Microbiologia, Universidad de Concepcion, Chile). *Bol. Chil. Parasitol.* 31(3/4):56-61; 1976.

2027 RADIOLOGICAL DIAGNOSIS OF ECHINOCOCCUS DISEASE IN MAN. (Ger.) Fernholz, H. J.; Nuvemann, M.; Willmen, R.; Doppelfeld, E. (Abteilung Radiologie der Rhein.-Westf. Techn. Hochschule, Goethestr. 27-29, 5100 Aachen, W. Germany). *Roentgenblaetter* 29(10):490-499; 1976.

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2055 DIAGNOSIS OF LIVER ESOPHAGEAL SPHINCTER (LES) INCOMPETENCE IN INFANTS [Abstract]. (Eng.) Vanderhoof, J. A.; Rapoport, P. J.; Paxson, C. L., Jr. (Univ. Nebraska Medical Center, Omaha, NB). *Gastroenterology* 72(5, Part 2):1144; 1977.

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See also, 1744, 1850, 1998, 2059, 2076, 2082, 2083, 2093, 2095, 2142, 2204, 2213, 2237, 2242, 2251, 2252, 2278, 2297, 2298, 2299, 2300, 2307, 2308, 2318, 2319, 2321, 2339, 2348, 2395, 2429, 2430, 2436, 2437, 2440, 2442, 2468, 2471, 2475, 2477, 2478, 2483, 2494, 2495, 2499, 2501, 2502, 2503, 2514, 2521, 2527, 2528, 2538, 2547, 2552, 2553, 2575, 2598, 2621, 2623.

GASTROINTESTINAL DISEASES

ESOPHAGUS

2059 TECHNIQUE AND EXPERIENCE WITH 24-HOUR ESOPHAGEAL pH MONITORING IN CHILDREN. (Eng.) Hill, J. L.; Pelligrini, C. A.; Burrington, J. D.; Reyes, H. M.; DeMeester, T. R. (22 S. Greene St., Baltimore, MD 21201). *J. Pediatr. Surg.* 12(6):877-887; 1977.

A 24-hr pH esophageal monitoring technique was used to evaluate gastroesophageal reflux in two normal control children and in five children with abnormal gastroesophageal reflux. The technique involved positioning a glass pH electrode through the nasopharynx 3 cm proximal to the distal esophageal sphincter. A second reference probe was wrapped on the nondominant forearm of the subject. For the two normal controls, values for the total number of refluxes (9 and 53, resp.); the percentage of time that the pH was less than 4 (0.84% and 2.1%, resp.); the number of refluxes greater than 5 min in duration (0 and 1, resp.); the percentage of reflux time in the supine (0.77% and 1.1%, resp.), upright (0.3% and 1.4%, resp.), and prone positions (1.53% and 1.8%, resp.); and the longest episode in minutes (3 and 16, resp.) revealed considerable variation regardless of age and maturation. A 9-month-old girl suffered frequent episodes of regurgitation and vomiting and underwent a Nissen fundoplication after having her narrowed distal esophagus dilated three times. Pre- and postoperative values were, resp., 131 and 28 for the total number of refluxes; 14% and 0.84% for the percentage of time the pH was less than 4.0; 8 and 0 for the number of refluxes greater than 5 min in duration; 4.14% and 0.54% for the percentage of reflux time in the supine position; 24% and 1.12% for the percentage of reflux time in the upright position; and 22 and 1 min for the longest episode. It is concluded that 24-hr esophageal monitoring has better objectivity, precision, sensitivity, and reliability than contrast studies, endoscopy, esophageal biopsy, acid perfusion, or acid reflux tests. The 24-hr pH monitoring technique assists in the evaluation of sphincter maturation, pulmonary disease, and the significance of body position.

2060 CONGENITAL CRICOPHARYNGEAL ACHALASIA. (Eng.) Reichert, T. J.; Bluestone, C. D.; Sieber, W. K.; Stool, S. E.; Sieber, A. M. (Children's Hosp. Pittsburgh, 125 DeSoto St., Pittsburgh, PA 15213). *Ann. Otol. Rhinol. Laryngol.* 86(5, Part 1):603-610; 1977.

Anatomical features, physiological aspects, methods of evaluation, clinical course, and recommendations for management are presented in 15 infants with congenital cricopharyngeal achalasia. Although most of the patients had symptoms at birth, the diagnosis was frequently not confirmed until later in the first year of life. While four of the infants had only cricopharyngeal achalasia, 11 had associated diseases related to the central nervous system. Those patients without associated diseases improved spontaneously with conservative management; most of the infants with other abnormalities also improved, although their clinical progress was slower and more complicated. In three patients, the symptoms were persistent, and there were two deaths related to associated diseases. Cricopharyngeal myotomy was carried out in two children with only moderate improvement in symptoms. Congenital cricopharyngeal achalasia is more common than formerly recognized. When suspected, an esophagram with tele- or cineradiography is essential to confirm the diagnosis. Esophageal motility studies will quantify changes and also evaluate lower esophageal dysfunction not easily identified on esophagrams.

2061 LOWER ESOPHAGEAL SPHINCTER DYSFUNCTION IN ESOPHAGEAL ATRESIA: NOCTURNAL REGURGITATION AND ASPIRATION PNEUMONIA. (Eng.) Shermeta, D. W.; Whitington, P. F.; Seto, D. S.; Haller, J. A. (Johns Hopkins Univ. Sch. Medicine, 601 N. Broadway, Baltimore, MD 21205). *J. Pediatr. Surg.* 12(6):871-876; 1977.

Esophageal manometry was used to assess esophageal function after successful repair of esophageal atresia and tracheoesophageal fistula (TEF) in six randomly selected patients and in two patients with recurrent pneumonitis. Esophageal peristalsis was irregular in every patient, and two patients with severe regurgitation and recurrent pneumonitis had marked gastroesophageal reflux. Six patients had normal lower esophageal sphincter (LES) function, with a resting pressure greater than 15 mm of Hg and uniform relaxation with swallowing. The two patients with recurrent pneumonitis, severe regurgitation, and demonstrable gastroesophageal reflux had abnormal LES function, with resting LES pressures of 0 and 11 mm Hg. The patient with the 11-mm Hg gradient had a Nissen fundoplication at the age of 1 yr; his LES did not relax with swallowing, suggesting that this pressure was the result of the surgically created sphincter. Bethanechol (0.075 mg/kg, i.m.) was administered to the two patients with subnormal LES pressure, and the LES function was normal 10 min after drug administration. The LES resting pressure in these two patients was 35 mm Hg and relaxed to gastric pressure with swallowing in both cases. Respiratory reversal occurred proximal to the LES, confirming the absence of hiatal hernia in both children. Esophageal manometry was performed at 1 week and at 9 months after the beginning of bethanechol therapy in one child. At 1 week, the resting LES pressure after p.o. bethanechol (1.25 mg) was 30 mm Hg, and relaxation was normal. At 9 months, the LES pressure before bethanechol was 0 mm Hg; after i.m. bethanechol it was 35 mm Hg, and relaxation was normal. These studies suggest that recurrent pneumonias after repair of TEF with esophageal atresia may be due to an incompetent LES in some children who have esophageal reflux and aspiration. They also demonstrate the usefulness of bethanechol

in managing the patient until surgical repair can be carried out.

2062 GASTRIN CONTENT OF COLUMNAR MUCOSA LINING THE LOWER (BARRETT'S) ESOPHAGUS. (Eng.) Dalton, M. D.; McGuigan, J. E.; Camp, R. C.; Goyal, R. K. (Univ. Texas Southwestern Medical Sch., 5323 Harry Hines Blvd., Dallas, TX 75235). *Am. J. Dig. Dis.* 22(11):970-972; 1977.

Tissue gastrin was determined in 36 biopsy specimens from the esophagus and 35 from the stomach in 12 patients with Barrett's esophagus. Histology of the mucosa from the area adjacent to the biopsy sites was also examined. Esophageal biopsies were obtained from three different sites in each patient. The gastric biopsies were obtained from the antrum, fundus, and the area just distal to the lower border of the lower esophageal sphincter. The columnar mucosa lining the esophagus was of three distinct types: fundic, transitional (cardiac), or specialized. None of these epithelia or the squamous epithelium showed any detectable gastrin. In contrast, antral mucosa had a very high gastrin content (4,870 ± 1,230 pg/mg); smaller amounts of gastrin were detected in duodenal epithelium (710 and 480 pg/ml in two specimens, resp.), whereas fundic mucosa contained very small amounts of gastrin. These results favor a metaplastic origin of Barrett's esophagus.

2063 PALLIATIVE INTUBATION AND RESECTION IN OESOPHAGEAL CARCINOMA. (Eng.) Angorn, I. B.; Hegarty, M. M.; Baker, L. W. (Dept. Surgery, Univ. Natal, Durban, South Africa). *J. R. Coll. Surg. Edinb.* 22(5):325-330; 1977.

The results of intubation with Celestin tubes or of resection for the palliation of dysphagia in squamous esophageal carcinoma were analyzed in 140 patients. Tumor characteristics that could influence the success of intubation, *viz*, site, length, the presence of total dysphagia, histopathological grading, esophageal axis disturbance, and respiratory tree involvement were evaluated. Intubation was successful in 71% of patients if the tumor was situated between the thoracic inlet and tracheal bifurcation, but in only 47% of patients with lesions more distally situated. The presence of esophageal axis disturbance and esophago-respiratory fistula adversely affected intubation. A randomized trial of intubation *versus* resection for lower esophageal tumors revealed significantly better results for resection. It is recommended that intubation be reserved for upper tumors, and palliative resection be considered for lower tumors.

2064 CRICOPHARYNGEAL MYOTOMY AS A METHOD OF TREATING CRICOPHARYNGEAL DYSPHAGIA SECONDARY TO GASTROESOPHAGEAL REFLUX. (Eng.) Henderson, R. D.; Marryatt, G. (Women's Coll. Hosp., Toronto, Ontario M5S 1B2, Canada). *J. Thorac. Cardiovasc. Surg.* 74(5):721-725; 1977.

Experience with cricopharyngeal myotomy for the treatment of pharyngoesophageal dysphagia secondary to gastroesophageal reflux during a 5-yr period is presented. Myotomy was used in 2 patients whose only symptom was dysphagia, in 3 patients too debilitated for major surgery, and in 15 patients with persistent pharyngoesophageal dysphagia following hiatal hernia repair. All were studied by barium esophagogram, endoscopy, and manometry. Radiologic aspiration of barium was apparent in 5 of 19 patients. High-speed manometric tracings showed intermittent cricopharyngeal incoordination in the six consecutive patients most recently studied. This finding of incoordination was present in 38 patients with reflux and in all with major cricopharyngeal symptoms. Myotomy was effective in relieving symptoms in patients in whom this was the only reflux symptom and in the patients too debilitated for major surgery. Good symptomatic improvement was obtained in nine patients with persistent dysphagia following hernia repair, but in three, relief was partial, with persistent symptoms being secondary to distal esophageal obstruction. Investigation is necessary to exclude other causes of dysphagia. However, with careful selection, myotomy has proved to be an effective method of treatment.

2065 SYMPTOMATIC REFLUX ESOPHAGITIS: A DOUBLE-BLIND CONTROLLED COMPARISON OF ANTACIDS AND ALGINATE. (Eng.) Graham, D. Y.; Lanza, F.; Dorsch, E. R. (Baylor Coll. Medicine, 1200 Moursund Ave., Houston, TX 77030). *Curr. Ther. Res.* 22(5): 653-658; 1977.

A 4-week double-blind study of the effectiveness of antacid tablets and of alginate-containing tablets was undertaken in 41 patients with esophagitis. The patients received either (a) a preparation containing stoichiometric amounts of alginic acid, sodium bicarbonate, and aluminum hydroxide dried gel (80 mg) and magnesium trisilicate (20 mg) or (b) an antacid containing co-dried aluminum hydroxide and magnesium carbonate (203.1 mg), manitol (101.53 mg), dextrose (1,159.74 mg), sucrose (101.53 mg), methyl cellulose (10.12 mg), calcium stearate (16.0 mg), and flavoring. Both treatment regimens produced significant improvement in severity and frequency of heartburn and in reversal of endoscopic findings of mucosal friability or erosions. Approximately 75% of both groups achieved complete healing of endoscopic manifestations of esophagitis. Antacid yielded better symptomatic relief, although the differences between the groups were not statistically significant. As the effectiveness of the two agents is probably dependent upon different mechanisms, it is possible that a combination of these agents would produce a synergistic effect and provide an ideal therapeutic regimen.

2066 STUDIES OF ESOPHAGEAL EPITHELIAL CELL PROLIFERATION IN PATIENTS WITH REFLUX ESOPHAGITIS. (Eng.) Livstone, E. M.; Sheahan, D. C.; Behar, J. (Yale Univ. Sch. Medicine, 333 Cedar St., New Haven, CT 06510). *Gastroenterology* 73(6): 1315-1319; 1977.

The *in vitro* proliferative activity of the basal zone of the esophagus was studied in suction biopsy specimens from 7 normal subjects, 19 patients with medically treated esophagitis, and 8 patients who had previously undergone anterior fundoplication. In the 10 patients with severe esophagitis, the basal zone showed a significantly elevated [^{3}H]thymidine labeling index (14.4 ± 2.2%) in contrast to that of mild esophagitis patients (6.4 ± 0.6%) and that of normal subjects (6.1 ± 0.7%, $p<0.05$). When esophagitis was associated with mucosal lesions at endoscopy, the labeling index was higher than that seen in esophagitis patients without endoscopic abnormalities ($p<0.05$). Significantly increased thymidine labeling was found only in patients with the most severe changes of papillary length or basal layer thickening. It is concluded that there is an increased basal zone uptake of [^{3}H]thymidine in severe esophagitis, which suggests increased cell turnover as the mechanism for basal zone hyperplasia. Present techniques for measuring mucosal uptake of [^{3}H]thymidine, however, do not permit the distinction of mild degrees of esophagitis from normal epithelium.

2067 COMPLICATIONS AND FAILINGS OF THE COMBINED COLLIS-BELSEY OPERATION. (Eng.) Orringer, M. B.; Sloan, H. (C7175 Univ. Hosp., Ann Arbor, MI 48109). *J. Thorac. Cardiovasc. Surg.* 74(5):726-735; 1977.

Complications and early follow-up data are presented on 83 patients who underwent the Collis-Belsey operation (gastroplasty combined with hiatal hernia repair). These patients were at risk for the recurrence of reflux after standard hiatal hernia repairs. There were two postoperative deaths. Complications related to multiple operations on the lower esophagus included injury to the spleen (3 patients), gastrocutaneous fistula (2 patients), and localized ischemic necrosis of the esophagus (2 patients). There were two esophageal perforations. In 4 of 15 patients, the combination of esophagomyotomy and the Collis-Belsey operation produced functional esophageal obstruction. Three patients experienced late major lower esophageal bleeding from ulceration of mucosa adjacent to the gastroplasty tube; two of these patients have no demonstrable gastroesophageal reflux. In addition to postoperative interviews and barium swallows, 77 patients were evaluated with esophageal manometry and acid reflux testing. After an average follow-up of 12 months, 19% have symptomatic reflux, but 30% have moderate-to-severe reflux with pH reflux testing. The recent popularity of the combined Collis-Belsey operation to reduce the incidence of recurrent gastroesophageal reflux should be tempered by continued, cautious, objective assessment of its long-term results.

2068 INTRAOPERATIVE AND POSTOPERATIVE ESOPHAGEAL MANOMETRIC FINDINGS WITH COLLIS GASTROPLASTY AND BELSEY HIATAL HERNIA REPAIR FOR GASTROESOPHAGEAL REFLUX. (Eng.) Cooper, J. D.; Gill, S. S.; Nelems, J. M.; Pearson, F. G. (Toronto General Hosp., Toronto, Ontario M5G 1L7, Canada). *J. Thorac. Cardiovasc. Surg.* 74(5):744-751; 1977.

The effect of gastroplasty and Belsey repair on intraluminal pressure changes in the gastroplasty and lower esophagus was studied in 11 patients. Manometry was performed preoperatively, intraoperatively, and postoperatively. In each case, the gastroplasty segment of the esophagus was found to function as a high pressure zone (HPZ). The pressure in this zone further increased following fundoplication. It could be diminished by the i.v. administration of hyoscine-*N*-butylbromide and augmented with i.v. pentagastrin. The original lower esophageal sphincter in most instances was included in the upper segment of the gastroplasty tube, but the entire length of the gastroplasty tube functioned as an HPZ, and pressures in the tube were considerably higher than those originally present in the lower esophageal sphincter. These studies provide a physiological basis for the effectiveness of gastroplasty and fundoplication.

2069 ABNORMALITIES OF GASTRIC EMPTYING AND PYLORIC REFLUX IN UNCOMPLICATED HIATUS HERNIA. (Eng.) Donovan, I. A.; Harding, L. K.; Keighley, M. R. B.; Griffin, D. W.; Collis, J. L. (General Hosp., Birmingham, England). *Br. J. Surg.* 64 (12):847-848; 1977.

The rate of gastric emptying of solid and liquid meals was studied in 10 patients with hiatal hernia, 22 patients with duodenal ulcer, and 8 controls, using an external scanning technique. Pyloric reflux was studied by a radiological technique. There was a significant delay in the emptying of both solid and liquid meals in the patients with hiatal hernia compared with both the duodenal ulcer patients (solid meals $p<0.01$, liquid meals $p<0.025$) and with normal controls (solid meals $p<0.05$, liquid meals $p<0.001$). Duodenogastric reflux was observed in 35% of hiatal hernia patients compared with 24% of duodenal ulcer patients and 0% of the controls. The findings of delayed gastric emptying and an increased incidence of duodenogastric reflux suggest a possible cause for the symptoms.

2070 ESOPHAGEAL HISTOLOGY IN GASTROESOPHAGEAL REFLUX: MORPHOMETRIC FINDINGS IN SUCTION BIOPSIES. (Eng.) Seefeld, U.; Krejs, G. J.; Siebenmann, R. E.; Blum, A. L. (Stadtspital Triemli, 8063 Zurich, Switzerland). *Am. J. Dig. Dis.* 22(11): 956-964; 1977.

To study the histological appearance of esophageal damage produced by reflux, esophageal suction biopsies were taken in 24 subjects with proven gastroesophageal reflux, 12 subjects with suspected reflux, and 20 healthy controls. Sixty-two percent of the patients with proven reflux, 33% of the patients with suspected reflux, and 10% of the controls had neutrophilic and/or eosinophilic granulocytes in the lamina propria. Lymphocytes, plasma cells, and basophilic granulocytes were shown to be constituents of the normal esophageal mucosa. All epithelial dimensions showed marked individual var-

iations in reflux patients and controls. The relative length of stromal papillae, as expressed in percent of total epithelial thickness, showed a linear correlation with relative basal cell thickness and an indirect linear correlation with epithelial thickness. Elongation of stromal papillae in proven reflux could only be demonstrated by arbitrary retrospective stratification of the data. Hyperplasia of the basal zone and thinning of the epithelium were not observed in the reflux patients. It is concluded that granulocytic infiltrates and not epithelial alterations are the most prominent histological finding in gastroesophageal reflux.

2071 THE EFFECT OF METOCLOPRAMIDE ON GASTRO-OESOPHAGEAL REFLUX. (Eng.) Pflucke, F.; Arendt, R. (Clinic Internal Medicine, Wilhelm Pieck Univ., Ernst Hendemann Strasse, DDR-25 Rostock, E. Germany). *Tijdschr. Gastroenterol.* 20(3):155-162; 1977.

Recordings of esophageal pH values in 17 patients with gastroesophageal reflux revealed that the i.v. administration of 0.15 mg/kg of metoclopramide significantly ($p<0.01$) reduced reflux duration and frequency. Reflux phenomena disappeared completely in 8 of the 17 patients, and the reflux frequency was reduced in 16 patients. The effect was seen clearly after 10-20 min and was still evident after 2 hr. The mean total reflux duration dropped from 31.9%/hr before metoclopramide treatment to 14.6%/hr after drug treatment. The mean reflux frequencies before and after drug treatment were 6.3/hr and 2.3/hr, resp. The effect of metoclopramide on reflux duration and frequency is probably dependent on the presence of a lower esophageal sphincter. Thus, if the sphincter region has been surgically removed, no considerable reflux-reducing effect can be expected.

2072 POSTPRANDIAL GASTRO-OESOPHAGEAL REFLUX IN HEALTHY PEOPLE. (Eng.) Kaye, M. D. (Univ. Vermont Coll. Medicine, Burlington, VT). *Gut* 18(9):709-712; 1977.

Studies were carried out to determine whether or not the normal lower esophageal sphincter remains continuously competent under physiological conditions, in an effort to provide a more solid basis for the definition of incompetence of the lower esophageal sphincter and to devise a test applicable to the investigation of physiological and pharmacological influences upon its competence. Distal esophageal pH was monitored for 3 hr after a standard meal in 10 young healthy subjects without symptoms of gastro-esophageal reflux. Episodes of reflux occurred in nine subjects, and in five, the esophageal pH was less than 5 for between 11% and 75% of the first postprandial hour. Intermittent incompetence of the lower esophageal sphincter after food must, therefore, be regarded as a normal phenomenon. The method described would be suitable for the evaluation of agents believed to weaken or to strengthen the lower esophageal sphincter.

2073 DIFFUSE SPASM OF THE ESOPHAGUS: CLINICAL, MANOMETRIC, AND SURGICAL CONSIDERATIONS. (Eng.) Leonardi, H. K.; Shea, J. A.; Crozier, R. E.; Ellis, F. H., Jr. (Lahey Clinic Foundation, 605 Commonwealth Ave., Boston, MA 02215). *J. Thorac. Cardiovasc. Surg.* 74(5):736-743; 1977.

Pre- and postoperative clinical, manometric, and roentgenographic findings are presented for 11 patients who underwent extended esophagomyotomy for diffuse spasm of the esophagus (DSE). Preoperative manometry performed in all patients disclosed a mean deglutitive pressure of 70 mm Hg in the diseased areas and indicated the required length of myotomy. The lower esophageal sphincter (LES) was within normal limits in most instances, with a mean amplitude of 20 mm Hg, and its exclusion from the myotomy eliminated the need for additional antireflux procedures. Postoperative manometry in 10 patients disclosed a 70% reduction in deglutitive pressures in the myotomized segments, and the mean LES amplitude of 13 mm Hg remained within the normal range (10-20 mm Hg). Ten of the 11 patients were clinically improved, and postoperative reflux developed in only 1 patient. These results support the continued use of extended esophagomyotomy in selected patients with DSE and suggest that exclusion of the LES from the myotomy affords satisfactory antireflux protection without ancillary sphincter-enhancing maneuvers.

2074 FURTHER EVALUATION OF THE SUGIURA PROCEDURE IN THE TREATMENT OF ESOPHAGEAL VARICES. (Eng.) Sugiura, M.; Futagawa, S. (Second Dept. Surgery, Univ. Tokyo, Hongo 7-3-1, Bunkyoku, Tokyo, Japan). *Arch. Surg.* 112(11):1317-1321; 1977.

The results of esophageal transection with paraesophagogastric devascularization (the Sugiura procedure) for bleeding esophageal varices were evaluated in 276 patients who underwent the procedure between 1967 and the present. Sixty procedures were prophylactic, 164 were elective, and 52 were emergency procedures. The age distribution was from 9 months to 74 yr. The origin was cirrhosis in 191 patients, fibrosis in 59, extrahepatic portal vein occlusion in 18, hepatoma in 5, schistosomiasis in 1, Budd-Chiari syndrome in 1, and carcinoma of the pancreas in 1 patient. The mortality within 1 month of surgery was 5.0% in prophylactic cases, 1.8% in elective cases, and 11.5% in emergency cases (mean, 4.3%). The 7-yr survival rate was 83%. There was an obvious positive correlation between survival rate and stage of the disease. Ninety-five percent of class A (Child's classification) and 87% of class B are alive, but only 59% of class C patients are alive at the present. Six patients had recurrences of varices for a recurrence rate of 2.3%, of whom four had esophageal bleeding. It may be that recurrence of varices occurred due to incomplete devascularization of the esophagus at the diaphragm because of the necessity of two-stage operations in poor-risk patients. All survivors are free from encephalopathy. This study reconfirms that the Sugiura method is safe and effective in controlling

esophageal variceal bleeding without compromising hepatic function.

2075 HISTOLOGY OF ESOPHAGEAL SMOOTH MUSCLE AND AUERBACH'S PLEXUS IN ELDERLY PERSONS [Abstract]. (Eng.) Eckardt, V. F.; LeCompte, P. M. (Lemuel Shattuck Hosp., Boston, MA). *Gastroenterology* 72(5, Part 2):1055; 1977.

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A case of gastric phytobezoar formation that was secondary to diabetic autonomic neuropathy is reported. Greatly impaired gastric emptying was documented in this case by the administration of a radiolabeled meal. The patient's half-time of gastric emptying was 282 min. The i.v. and p.o. administration of metoclopramide hydrochloride (10 mg, 4 x/day, p.o.) completely corrected the patient's gastric motility disturbance. Diabetic autonomic neuropathy may result in delayed gastric emptying and gastric retention.

2112 STUDIES ON SERUM GASTRIN OF THE PATIENTS WITH GASTRIC CANCER. (Eng.) Itoh, T.; Tatsuta, M.; Tamura, H.; Yamamura, H.; Iwanaga, T. (Center for Adult Diseases, 1 Chome, Nakamichi, Higashinari-ku, Osaka 537, Japan). *Am. J. Gastroenterol.* 68(1):56-63; 1977.

In 46 patients with gastric cancer who were to undergo gastrectomy, the fasting serum gastrin concentration in the peripheral vein was estimated by radioimmunoassay. Blood samples were also collected from the gastric veins and artery during the operations. These gastrin values were compared with morphological findings in the resected stomach. No significant difference in serum gastrin concentration was found between the patients with gastric cancer and 11 normal subjects. In the patients with mucosal atrophy in the oxyntic gland area but with no atrophy in the pyloric gland area, however, a significant increase in serum gastrin concentration ($p<0.05$) was observed. In cases in which fundal atrophy was accompanied by atrophy in the pyloric gland area, this increase was not observed. The gastrin content of the cancerous tissue was negligible. These results indicate that the increase in serum gastrin concentration in some patients with gastric cancer might be due to the associated atrophy of the oxyntic glands.

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2155 RELATIONSHIP OF CHRONIC GASTRITIS AND PEPTIC ULCER [Abstract]. (Eng.) Mazzone, O.; Trovato, G. (Clinica Medica I dell'Universita, Catania, Italy). *Rend. Gastroenterol.* 9(1):54; 1977.

2156 IMMUNE ASPECTS OF PERNICIOUS ANAEMIA AND ATROPHIC GASTRITIS. (Eng.) Taylor, K. B. (No affiliation given). *Clin. Haematol.* 5(3):497-520; 1976.

2157 IRON ABSORPTION IN GASTRIC AND DUODENAL PATHOLOGY IN PATIENTS WITH IRON DEFICIENCY ANAEMIAS. (Eng.) Ryabov, S. I.; Ryss, E. S. (First Medical Inst., Leningrad, Lew Tolstei St. 6-8, Leningrad P89, USSR). *Folia Haematol. (Leipz.)* 103(6):906-914; 1976.

2158 GASTRIN CONCENTRATIONS IN SERUM AND GASTRIC MUCOSA IN PATIENTS WITH PERNICIOUS ANAEMIA. (Eng.) Brandsborg, M.; Elsborg, L.; Andersen, D.; Brandsborg, O.; Bastrup-Madsen, P. (Univ. Dept. Medicine II, Aarhus Amtssygehus, DK-8000 Aarhus C, Denmark). *Scand. J. Gastroenterol.* 12(5):537-541; 1977.

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See also, 1700, 1768, 1797, 1807, 1827, 1831, 1832, 1833, 1842, 1990, 1994, 2000, 2033, 2034, 2035, 2038, 2040, 2042, 2043, 2048, 2049, 2050, 2056, 2057, 2064, 2067, 2068, 2069, 2070, 2071, 2072, 2076, 2085, 2102, 2103, 2104, 2107, 2140, 2163, 2165, 2167, 2172, 2173, 2175, 2176, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2193, 2195, 2197, 2200, 2205, 2210, 2246, 2542, 2550, 2551, 2575, 2585, 2601, 2602.

STOMACH

Peptic Ulcers

2163 GASTRIC CYCLIC NUCLEOTIDE CONCENTRATION IN HEALTH AND DISEASE. RESPONSE TO SECRETAGOGUES AND ROLE OF CIRCULATING GASTRIN AND INTRAGASTRIC ACID SECRETION. (Eng.) Levine, R. A.; Schwartzel, E. H., Jr.; Bachman, S.; Talev, J. N. (Upstate Medical Center, 750 East Adams St., Syracuse, NY 13210). *Gastroenterology* 73(4, Part 1): 737-745; 1977.

Cyclic AMP and cyclic guanosine monophosphate (GMP) concentrations were measured in suction biopsy specimens of gastric fundic and antral mucosa and in gastric juice in response to maximum stimulation by histamine (0.015 mg/kg/hr), betazole (1.5 mg/kg), and pentagastrin (6 μg/kg) in 14 normogastrinemic healthy subjects, in 46 patients with dyspepsia or peptic ulcer (PU) disease and normal serum gastrin levels, and in 14 patients with hypergastrinemia (8 with pernicious anemia [PA], 3 with Zollinger-Ellison [ZE] syndrome, and 3 with gastric carcinoma). No regional differences were noted in unstimulated gastric antral or fundic cyclic nucleotide content in normal subjects or patients. During secretagogue stimulation, no significant changes in cyclic nucleotide concentrations were observed in antral or fundic mucosa of healthy subjects or patients. During basal hourly secretion, cyclic nucleotide concentration and output in gastric juice were relatively constant, suggesting a steady state of secretion. After secretagogue stimulation, the concentrations of cyclic AMP and cyclic GMP were reduced by at least 50% and correlated with the increased parietal volume output, suggesting a dilutional effect. There was no significant change in gastric juice cyclic nucleotide output except in PU subjects after betazole stimulation, in whom cyclic AMP production increased almost twofold. This change in gastric juice cyclic AMP concentration was proportional to a greater parietal volume flow and did not reflect intracellular mucosal events. Similarly, a decreased concentration of cyclic AMP in the basal and stimulated gastric juice of ZE patients and a reduced cyclic AMP output in PA patients was also proportional to volume flow. The presence of cyclic AMP in unstimulated gastric juice in PA suggests, in part, a nonparietal origin for cyclic AMP, probably derived from interstitial fluid secretion or transmucosal exudation from plasma. It is concluded that intra- or extracellular gastric cyclic AMP or cyclic GMP concentrations are not modulated by secretagogue stimulation, circulating high gastrin levels, alteration in intraluminal pH, or increasing age. These studies fail to implicate cyclic nucleotides as intracellular mediators of stimulated gastric acid secretion in healthy subjects, PU disease PA, ZE syndrome or gastric carcinoma.

2164 GASTRIC SECRETION AND EMPTYING AFTER ORDINARY MEALS IN DUODENAL ULCER. (Eng.) Malagelada, J. R.; Longstreth, G. F.; Deering, T. B.; Summerskill, W. H. J.; Go, V. L. W. (Mayo Clinic, Rochester, MN 55901). *Gastroenterology* 73(5):989-994; 1977.

The gastric response to an ordinary solid-liquid meal was studied in 12 patients with active duodenal ulcer and 8 healthy volunteers, using gastric and duodenal markers to quantify acid, pepsin, and volume outputs in response to the meal, without manipulating intragastric pH. Intragastric volume, rate of gastric emptying, delivery of acid into the duodenum, and serum gastrin response were also measured simultaneously. On a separate day, peak acid output in response to betazole (1.5 mg/kg, s.c.) was determined. There was an inappropriately prolonged gastric secretory response to meals in duodenal ulcer disease, without a concomitant increase in peak postprandial secretory rates or an increase in serum immunoreactive gastrin levels. The stomach in duodenal ulcer disease did not "retain" the additional acid secreted in the

later postprandial period, and abnormally high rates of acid delivery into the duodenum occurred. These data are consistent with a dual defect in the duodenal mechanisms regulating both acid secretion and acid delivery into the duodenum.

2165 ACID AND ENDOCRINE RESPONSES TO MEALS VARYING IN pH IN NORMAL AND DUODENAL ULCER SUBJECTS. (Eng.) Thompson, J. C.; Swierczek, J. S. (Univ. Texas Medical Branch, Galveston, TX 77550). *Ann. Surg.* 186(4):541-548; 1977.

Gastric acid, gastrin, gastric inhibitory peptide (GIP), and secretin responses to meals (varying in pH) were compared in 12 normal subjects and 9 duodenal ulcer patients. Acid secretion was measured by an intragastric titration method that allows actual measurement of acid response to food within the stomach (10% amino acid meal, adjusted to various pH levels, 7-1.5). Blood samples were collected at each pH level for radioimmunoassay of gastrin, secretin, and GIP. Gastric acid and gastrin responses to the amino acid meal (AAM) were significantly greater in duodenal ulcer patients than in normal subjects. In duodenal ulcer patients, acid response to AAM at pH 7 or 5.5 reached 82% of Histolog maximum. Decreasing the pH of the meal resulted in a stepwise reduction in both acid secretion and gastrin in normal subjects and duodenal ulcer patients. At pH 1.5, acid inhibition was complete, but gastrin inhibition was partial. Secretin concentration increased significantly at pH 1.5; there was no difference in secretin release between the groups. Plasma GIP was highest at pH 7 in all individuals. Use of a marker substance showed 80% recovery of AAM at pH 7-4; below pH 4, recovery rose to about 90%. It is concluded that gastric acid and gastrin release are pH-dependent in normal subjects and duodenal ulcer patients. Inhibition of gastric secretion by acidified meals is associated with a pH-dependent suppression of gastrin and GIP levels and an elevation of plasma secretin. This study confirms increased acid and gastrin responses in duodenal ulcer patients but shows no evidence of defective feedback inhibition of gastric secretion and gastrin release.

2166 THE EFFECT OF GASTRIC DISTENSION ON THE SECRETION OF ACID AND PEPSIN BY PATIENTS WITH DUODENAL ULCER. (Eng.) Saunders, J. H. B.; Wormsley, K. G. (Ninewells Hosp., Dundee DD2 1UB, Scotland). *Acta Hepatogastroenterol.* 24(4):271-277; 1977.

The effect of gastric distention on the secretion of acid and pepsin was studied in 24 patients with chronic duodenal ulcers to determine the presence of "neural tone." Basal secretion was collected for 1 hr from 14 patients who were successively insufflated with 50, 100, and 200 ml of air by a rubber balloon (each distention was maintained for 30 min). Gastric contents were collected every 15 min and the acid and pepsin levels were assayed. Nine of these patients were subjected to a second test and were insufflated with 200 ml of air for 1 hr after collection of a 1-hr basal secretion. Seven other patients received only the second test. Acid and pepsin secretion after graded distention displayed similar patterns. The mean acid output of the 14 subjects was 2.4 mmol/30 min, and was 3.4 (42% greater than basal values), 2.6, and 5.5 mmol/30 min (129%) in response to 50, 100, and 200 ml of air, resp. Pepsin output was increased by 31 and 79% in response to 50 and 200 ml of air, resp. Acid and pepsin secretion in response to prolonged distention with 200 ml of air was similar to that observed with graded distention; there was a 59% increase in acid concentration, a 173% increase in acid output, and a 151% increase in pepsin output. In a third test schedule, pentagastrin was infused 1 hr before distention with 200 ml of air. Low doses (0.02 μg/kg body weight/hr, 12 subjects) produced an acid response 83% greater, and a pepsin response 43% greater, than basal values. A high dose of pentagastrin (2 μg/kg/hr) had no significant effect on acid or pepsin output. Thus, distention stimulated gastric secretion in a manner similar to, but weaker than, pentagastrin. The results suggest that gastric distention does not produce a "neural" stimulus for the gastric secretion of acid or pepsin in man.

2167 IS THERE AN OXYNTOPYLORIC REFLEX FOR RELEASE OF GASTRIN IN MAN? (Eng.) Grotzinger, U.; Rehfeld, J. F.; Olbe, L. (Kantonsspital, CH-4004 Basel, Switzerland). *Gastroenterology* 73(4, Part 1):753-757; 1977.

In order to determine whether gastrin released by an oxyntopyloric reflex contributes to acid secretion, plasma gastrin concentrations and gastric acid output were measured during graded balloon distention of the gastric fundus and body in 20 patients with duodenal ulcer. Acid output rose stepwise with increasing distention volumes, but plasma gastrin remained unchanged. During intragastric neutralization in five subjects, fundic distention did not elicit a significant rise in plasma gastrin, whereas the acid response was similar to that observed in the control study when the gastric contents were acid. In eight patients, proximal gastric vagotomy profoundly suppressed the acid response to fundic distention. Basal plasma gastrin concentrations were elevated after vagotomy, but were unchanged during graded fundic distention. The results suggest that neural reflex activation of the oxyntic glands is the main mechanism by which fundic distention stimulates acid secretion in man. The failure of fundic distention to release gastrin does not completely rule out the existence of an oxyntopyloric distention reflex for gastrin release in man. Fundic distention in man seems to both stimulate acid secretion and induce an inhibitory mechanism acting on acid secretion. The authors suggest that this inhibitory mechanism may also mask the effect of an oxyntopyloric reflex for gastrin release. The present study and earlier work suggest that, in man, distention of the stomach is a poor stimulus for release of gastrin, regardless of whether the

pyloric or the oxyntic gland area, or both, are distended.

2168 THE ACTION OF ANTACIDS ON SERUM GASTRIN CONCENTRATIONS IN MAN. (Eng.) Feurle, G. E. (Medizinische Universitats-Poliklinik, Hospitalstrasse 3, D-6900 Heidelberg, W. Germany). *Klin. Wochenschr.* 55(21):1039-1042; 1977.

To investigate the effect of antacids on serum gastrin concentration, the effects of two doses of NaCl and $NaHCO_3$, as well as of $AlCl_3$ (all three substances, 30 ml, 8 g/100 ml) and $Al(OH)_3$ (30 ml, 5.4 g/100 ml), resp., on serum gastrin concentrations and intragastric pH were compared in 27 duodenal ulcer patients. In addition, the effect of one dose of an AlPO containing commercial antacid on serum gastrin concentration and intragastric pH was studied in duodenal ulcer patients and in seven controls. Care was taken to induce swallowing at the times that the substances were given through an orogastric tube. Antacids elicited significantly greater gastrin responses than their nonbuffering chloride compounds ($p<0.05$), and the rise in gastrin level after a single dose of antacid was small but significant ($p<0.05$) in duodenal ulcer patients and insignificant in nonulcer controls. Several factors such as rising intragastric pH, individual responsiveness, duodenal ulcer state, vagal influences, and the participating ions, and their amount contribute to the rise in gastrin levels after antacids.

2169 CARBENOXOLONE SODIUM CAPSULES IN THE TREATMENT OF DUODENAL ULCER: AN ENDOSCOPIC CONTROLLED TRIAL. (Eng.) Sahel, J.; Sarles, H.; Boisson, J.; Bonnet-Eymard, J.; Cornet, A.; Delmont, J.; *et al.* (U-31 INSERM, Marseille, France). *Gut* 18(9):717-720; 1977.

The results of carbenoxolone treatment for duodenal ulcer were assessed in a multicenter controlled trial of 86 patients with duodenal ulcer who were treated with carbenoxolone capsules (50 mg, q.i.d. for 6 weeks) or a placebo. Sixty-nine patients underwent endoscopy at the beginning and end of the treatment. Symptomatic responses and endoscopic improvement were significantly greater in those receiving the active preparation than in those receiving the control capsules; complete, endoscopically assessed, healing was achieved in 65% and 20%, resp., of individuals who underwent endoscopy, after 6 weeks of treatment. Side-effects of salt and water retention or hypokalemia were noted in over one-fourth of those receiving the carbenoxolone capsules, but none of the adverse effects was severe enough to necessitate withdrawal of treatment. The results show that treatment with carbenoxolone sodium capsules accelerates the healing of duodenal ulcers and that this healing is paralleled by the remission of symptoms.

2170 CIMETIDINE FOR DUODENAL ULCERATION IN PATIENTS UNDERGOING HAEMODIALYSIS. (Eng.) Doherty, C. C.; O'Connor, F. A.; Buchanan, K. D.; McGeown, M. G. (Belfast City Hosp., Belfast BT9 7AB, Northern Ireland). *Br. Med. J.* 2(6101):1506-1508; 1977.

The effect of cimetidine was assessed in the treatment of nine patients with acid hypersecretion and endoscopically diagnosed duodenal ulceration who were undergoing hemodialysis. The patients obtained good pain relief and suffered no serious side-effects. Both basal and stimulated acid output fell considerably, and the plasma gastrin response to food increased during treatment. Two patients with recurrent vomiting during hemodialysis had a striking response to cimetidine, which suggested that such vomiting may be acid-mediated in some patients. These preliminary results suggest that cimetidine may prove to be an advance in the management of peptic ulcer in uremic patients.

2171 DOUBLE-BLIND CLINICAL TRIAL ON GASTRODUODENAL ULCER HEALING WITH PROSTAGLANDIN E_2 ANALOGUES. (Eng.) Gibinski, K.; Rybicka, J.; Mikos, E.; Nowak, A. (Silesian Sch. Medicine, Katowice, Poland). *Gut* 18(8):636-639; 1977.

Seventy-seven patients with gastroduodenal ulcer were treated p.o. with two methyl-prostaglandin E_2 analogues (m-PGE_2) in a double-blind clinical trial. Each of three groups was given 15 S-15 methyl PGE_2 methyl ester (1.5 µg/kg), 15 R-15 methyl PGE_2 methyl ester (2 µg/kg), and placebo, resp. Both forms of m-PGE_2 analogues appeared to reduce gastric acid secretion ($p<0.01$ for 15 R-15 methyl PGE methyl ester; $p<0.001$ for 15 S-15 methyl PGE_2 methyl ester), to shorten ulcer healing ($p<0.001$ for 15 S-15 methyl PGE_2 methyl ester only), and also to produce some side-effects (diarrhea, vomiting, and pain), form "S" being the more potent. Prompt healing of the ulcer with these agents did not prevent the recurrence of the disease. As the serum gastrin response to a meal after m-PGE_2 administration was not reduced, this agent seems directly to affect oxynthic cells.

2172 FAT INDUCED JEJUNAL INHIBITION OF GASTRIC ACID SECRETION IN DUODENAL ULCER PATIENTS BEFORE AND AFTER TRUNCAL VAGOTOMY. (Eng.) Christiansen, J. (Glostrup Hosp., DK-2600 Glostrup, Copenhagen, Denmark). *Ann. Surg.* 186(5):573-576; 1977.

To investigate whether fat-induced jejunal inhibition of acid secretion in man is dependent on intact vagal innervation, the effect of intrajejunal infusion of a fat solution on pentagastrin-stimulated (0.5 µg/kg/hr) gastric acid secretion was studied in five duodenal ulcer patients before and 3 to 5 months after truncal vagotomy. Preoperatively, the mean acid output was reduced from 41 ± 5.2 mEq H^+/hr to 15.4 ± 1.3 mEq H^+/hr ($p<0.005$), and postoperatively from 17.4 ± 2.6 mEq H^+/hr to 12.7 ± 2.4 mEq/hr ($p<0.01$). These results demonstrate that fat-induced jejunal inhibition of gastric acid secretion is humorally mediated either in whole or in part. Furthermore, fat-induced jejunal inhibition of acid

secretion in duodenal ulcer patients seems to be of the same magnitude as previously found in healthy subjects.

2173 CAUSES OF DEATH IN DUODENAL AND GASTRIC ULCER. (Eng.) Bonnevie, O. (Hvidovre Hosp., Univ. Copenhagen, 2650 Hvidovre, Denmark). *Gastroenterology* 73(5):1000-1004; 1977.

An analysis was made of 235 deaths that occurred among 1,905 patients with peptic ulcer to examine whether these patients died more frequently than expected of specific diseases. These patients constituted a random sample of the occurrence of ulcer disease in an area of Denmark comprising half a million inhabitants. The disease itself, according to the death certificate, was considered the primary cause of death in 10% of the cases; half of these had been operated on immediately before death. The other patients died more frequently than expected from the following causes: chronic bronchitis, pulmonary emphysema, lung cancer, liver cirrhosis, and pancreatic cancer. Although the comorbidity with chronic bronchitis and emphysema was especially pronounced in patients with gastric ulcer, the association with liver cirrhosis and pancreatic cancer occurred only in patients with duodenal ulcer. In women, the mortality rate attributable to cardiac and vascular diseases was lower than expected. No excess coincidence of suicide was found. Berkson's fallacy, a false association between diseases, is considered to be of much less importance as a possible explanation of the comorbidity found in the present study than in the majority of publications concerned with this question.

2174 THE BIOAVAILABILITY OF CIMETIDINE IN PATIENTS WITH PEPTIC ULCER DISEASE BEFORE AND DURING CIMETIDINE TREATMENT [Abstract]. (Eng.) Bodemar, G.; Norlander, B.; Fransson, L.; Walan, A. (Linkoping Univ. Hosp., Linkoping, Sweden). *Gastroenterology* 12(Suppl. 45):10; 1977.

2175 CONSERVATIVE TREATMENT OF PERFORATED PEPTIC ULCER. 20 YEARS EXPERIENCE [Abstract]. (Eng.) Beisland, H. O. (Lillehammer Hosp., Lillehammer, Norway). *Scand. J. Gastroenterol.* 12(Suppl. 45):8; 1977.

2176 CIMETIDINE IN ONE YEAR TREATMENT OF RECURRENT PEPTIC ULCER DISEASE [Abstract]. (Eng.) Bodemar, G.; Walan, A. (Linkoping Univ. Hosp., Linkoping, Sweden). *Scand. J. Gastroenterol.* 12(Suppl. 45):11; 1977.

2177 THE INFLUENCE OF A MEAL AND ANTACIDS ON CIMETIDINE ABSORPTION IN PATIENTS WITH PEPTIC ULCER DISEASE [Abstract]. (Eng.) Bodemar, G.; Norlander, B.; Fransson, L.; Walan, A. (Linkoping Univ. Hosp., Linkoping, Sweden). *Scand. J. Gastroenterol.* 12(Suppl. 45):12; 1977.

2178 SURVIVAL IN PEPTIC ULCER [Abstract]. (Eng.) Bonnevie, O. (Hvidovre Hosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 12(Suppl. 45):14; 1977.

2179 PERFORATED DUODENAL ULCER TREATED BY SIMPLE SUTURE, ONCE AGAIN [Abstract]. (Eng.) Baekgard, N.; Lawaetz, O.; Poulsen, P. E. (Glostrup Hosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 12(Suppl. 45):15; 1977.

2180 JEJUNAL INHIBITORY MECHANISMS OF GASTRIC ACID SECRETION IN NORMAL SUBJECTS AND DUODENAL ULCER PATIENTS [Abstract]. (Eng.) Christiansen, J. (Glostrup Hosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 12(Suppl. 45): 16; 1977.

2181 INHIBITION OF BASAL AND PENTAGASTRIN STIMULATED GASTRIC ACID SECRETION AFTER LONG TERM TREATMENT WITH BENZILONIUM BROMIDE [Abstract]. (Eng.) Jaska, F.; Steen, S. (Koping Hosp., Koping, Sweden). *Scand. J. Gastroenterol.* 12(Suppl. 45):39; 1977.

2182 THE AARHUS COUNTY VAGOTOMY TRIAL. INTERIM REPORT [Abstract]. (Eng.) Amdrup, E.; Andersen, D.; Hostrup, H. (Kommunehospitalet, Aarhus, Denmark). *Scand. J. Gastroenterol.* 12(Suppl. 45):4; 1977.

2183 THE DIFFERENT COMPONENTS OF GASTRIC EMPTYING AFTER GASTRIC SURGERY. (Eng.) Donovan, I. A. (General Hosp., Birmingham, England). *Ann. R. Coll. Surg. Engl.* 58(5):368-373; 1976.

2184 PROXIMAL GASTRIC VAGOTOMY WITHOUT DRAINAGE PROCEDURE IN PATIENTS WITH PEPTIC ULCER [Abstract]. (Ger.) Haiderer, O.; Jatzko, G. (Landeskrankenh., Klagenfurt, Austria). *Wien. Klin. Wochenschr.* 126(28/31):428-430; 1976.

2185 EVALUATION OF RECURRENT DUODENAL ULCER AFTER VAGOTOMY PYLOROPLASTY. (Eng.) Juler, G. L.; Dagradi, A. E.; Stempien, S. J.; Combs, R. C. (Veterans Admin. Hosp., Long Beach, CA 90822). *Am. J. Surg.* 132(2):243-248; 1976.

2186 ULTRASTRUCTURAL CHANGES IN THE GASTRIC MUCOSA AFTER SELECTIVE PROXIMAL VAGOTOMY [Abstract]. (Eng.) Savola, J.; Aarimaa, M.; Kalimo, H. (Dept. Pathological Anatomy, Univ. Turku, SF-20520 Turku 52, Finland). *Scand. J. Gastroenterol.* 12(Suppl. 45):88; 1977.

2187 IS PROXIMAL GASTRIC VAGOTOMY (PGV) AN ADEQUATE OPERATION IN DUODENAL ULCER PATIENTS WITH HIGH ACID SECRETION [Abstract]?

(Eng.) Roland, M.; Liavag, I. (Aker Univ. Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 12(Suppl. 45):81; 1977.

2188 MAXIMUM ACID OUTPUT IN DUODENAL ULCER PATIENTS WITH DIFFERENT LENGTH OF ULCER HISTORY AND IN CONTROLS WITHOUT DYSPEPSIA [Abstract]. (Eng.) Kronberg, O.; Christiansen, P. M. (Bispebjerg Hosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 12(Suppl. 45):50; 1977.

2189 PROXIMAL GASTRIC VAGOTOMY WITH SUPRA-PYLORIC MUCOSAL ANTRECTOMY FOR DUODENAL ULCER [Abstract]. (Eng.) Kronberg, O. (Bispebjerg Hosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 12(Suppl. 45):49; 1977.

2190 EARLY ENDOSCOPY IN THE PREDICTION OF FURTHER HAEMORRHAGE FROM PEPTIC ULCERS [Abstract]. (Eng.) Foster, D. N.; Miloszewski, K. J. A.; Losowsky, M. S. (Dept. Medicine, Univ. Leeds, Leeds, England). *Gut* 18(11):A987; 1977.

2191 FACTORS AFFECTING THE INCIDENCE AND TREATMENT OF POST-VAGOTOMY DIARRHOEA [Abstract]. (Eng.) Taylor, T. V.; Lambert, M. E.; Torrance, B. (Manchester Royal Infirmary, Manchester, England). *Gut* 18(11):A989; 1977.

2192 PERFORATION OF CHRONIC DUODENAL ULCER DURING TREATMENT WITH CIMETIDINE [Letter to Editor]. (Eng.) Ellis, D. J.; Hamer, J. D.; Baker, S. E. (Queen Elizabeth Hosp., Birmingham, England). *Br. Med. J.* 2(6101):1538; 1977.

2193 VAGOTOMY AND INTRAGASTRIC ACIDITY [Abstract]. (Eng.) McCloy, R. F.; Girvan, D. P.; Baron, J. H. (Royal Postgraduate Medical Sch., London, England). *Gut* 18(11):A947; 1977.

2194 CIMETIDINE AND POSTGASTRECTOMY RECURRENT ULCER [Letter to Editor]. (Eng./Ita.) Delle Fave, G. F.; Paoluzi, P.; Bergonzi, L.; De Magistris, L.; Sparvoli, C.; Carratu, R. (Policlinico Umberto I, Rome, Italy). *Rend. Gastroenterol.* 9(2):150-151; 1977.

2195 AETIOLOGY OF GASTRITIS OCCURRING AFTER SURGERY FOR PEPTIC ULCER [Abstract]. (Eng.) Hoare, A. M.; Chapel, H. M.; Alexander-Williams, J. (Queen Elizabeth Hosp., Birmingham, England). *Gut* 18(11):A955-A956; 1977.

2196 PEPTIC ULCER IN RENAL FAILURE [Abstract]. (Eng.) Doherty, C. C.; O'Connor, F. A.; Buchanan, K. D.; Sloan, J. M.; Ardill, J. E. S.; McGeown, M. G. (Belfast City Hosp., Belfast, Northern Ireland). *Gut* 18(11):A964-A965; 1977.

2197 LONG-TERM EFFECTS OF CIMETIDINE ON GASTRIC SECRETION [Abstract]. (Eng.) Holden, R. J.; Hearns, J. B.; McKibben, B.; Buchanan, K. B.; Crean, G. P. (Southern General Hosp., Belfast, Northern Ireland). *Gut* 18(11):A949; 1977.

2198 EFFECT OF ONE YEAR'S TREATMENT WITH CIMETIDINE ON FASTING AND OXO-STIMULATED SERUM GASTRIN IN DUODENAL ULCER PATIENTS [Abstract]. (Eng.) Spence, R. W.; Celestin, L. R.; McCormick, D. A.; Owens, C. J.; Oliver, J. M. (Frenchay Hosp., Bristol, England). *Gut* 18(11):A949; 1977.

2199 ARE PROSTAGLANDINS DEFICIENT IN PEPTIC ULCERATION [Abstract]? (Eng.) Baker, R.; Jaffe, B. M.; Reed, J. D.; Shaw, B.; Venables, C. W. (Dept. Surgery, Univ. Newcastle upon Tyne, New Castle upon Tyne, England). *Gut* 18(11):A950-A951; 1977.

2200 EFFECTS OF PROXIMAL GASTRIC VAGOTOMY AND TRUNCAL VAGOTOMY AND ANTRECTOMY ON GASTRITIS, BILE REFLUX, AND ACID OUTPUT [Abstract]. (Eng.) Hoare, A. M.; Donovan, I.; Alexander-Williams, J. (Queen Elizabeth Hosp., Birmingham, England). *Gut* 18(11):A950; 1977.

See also, 1713, 1783, 1830, 1842, 1848, 1859, 1980, 1990, 1994, 2000, 2023, 2040, 2043, 2113, 2115, 2116, 2118, 2128, 2129, 2135, 2140, 2142, 2144, 2145, 2150, 2155, 2201, 2535, 2550.

SMALL INTESTINE

2201 PERFUSION OF THE PROXIMAL SMALL INTESTINE WITH PEPTONE STIMULATES GASTRIC ACID SECRETION IN MAN. (Eng.) Isenberg, J. I.; Ippoliti, A. F.; Maxwell, V. L. (Veterans Admin. Wadsworth Hosp. Center, Los Angeles, CA 90073). *Gastroenterology* 73(4):746-752; 1977.

To test the hypothesis that intestinal stimulants originating in the human proximal small intestine increase gastric acid secretion, the duodenum was infused with 10% peptone (weight/volume, 400 mOsm at 2 ml/min for 4 hr in seven normal subjects and seven duodenal ulcer patients. The duodenum was perfused through a gastroduodenal tube, with two balloons straddling the pylorus to prevent duodenogastric reflux. As a control, 0.2 M NaCl was per-

fused into the duodenum at 2 ml/min for 4 hr on another day. The order of testing was randomized. Gastric acid secretion increased gradually during duodenal peptone perfusion and reached a peak response during the second hour of infusion. During the second hour of peptone infusion, the mean peak 30-min secretory rate was 203.8 ± 31.9 μEq/min, and during NaCl infusion, it was 87.8 ± 27.2 μEq/min ($p<0.01$). Duodenal perfusion with 0.2 N NaCl did not stimulate acid secretion. Peak 30-min secretory rate after pentagastrin (6 μg/kg, s.c.) measured on another day was 657.6 ± 50.6 μEq/min. The mean peak secretory response during the second hour of duodenal peptone perfusion was 32.6 ± 4.6% of the peak response to pentagastrin. During the time periods when gastric acid secretion was at a peak response, serum gastrin, measured at 30-min intervals throughout both tests, was unchanged from basal and NaCl control. However, the mean serum gastrin did increase slightly (approximately 16 pg/ml) but significantly in the 14 subjects during the last 90 min of duodenal peptone perfusion. Validation experiments revealed good reproducibility of the responses to duodenal peptone or NaCl perfusion, absence of an increase in gastric acid secretion or serum gastrin in response to gastric perfusion of 10% peptone in a volume equivalent to the volume that refluxed during the 4 hr of duodenal peptone perfusion, and no effect on gastric acid secretion or serum gastrin of the gastroduodenal tube with or without inflation of the duodenal and gastric balloons. These studies indicate that there is an intestinal phase of gastric acid secretion in normal man and in patients with duodenal ulcer in response to duodenal peptone perfusion, that it has a latent period of about 1 to 2 hr until the peak response is reached, and that the response is probably not primarily attributable to gastrin release.

2202 CARCINOID TUMORS, VASCULAR ELASTOSIS, AND ISCHEMIC DISEASE OF THE SMALL INTESTINE.

(Eng.) Qizilbash, A. H. (Henderson General Hosp., 711 Concession St., Hamilton, Ontario L8V 1C3 Canada). *Dis. Colon Rectum* 20(7):554-560; 1977.

The incidence of elastic vascular sclerosis and/or ischemia complicating carcinoid tumors was assessed in 21 patients, and the clinical and pathologic features of the condition are presented. Ischemic enteritis or infarction occurred in 4 of 15 patients who had carcinoid tumors of the small intestine. All four, in addition, had elastic vascular sclerosis of the mesenteric vessels. Both arteries and veins were involved, and the change occurred in the region of tumor deposit. In none of the cases was the tumor occluding the lumen of the vessels, nor was there any evidence of thrombosis. Ischemic changes occurred in two of the six patients with large intestinal carcinoid tumors, although elastic vascular sclerosis and infarction were absent. The findings suggest a direct rather than a humoral effect. It appears that cancer cells exert an inductive effect on the fibroblast or smooth muscle cell in vascular walls, causing excess production of elastic tissue.

2203 DUAL IMMUNE DEFECTS IN NONGRANULOMATOUS ULCERATIVE JEJUNOILEITIS WITH HYPOGAMMAGLOBULINEMIA.

(Eng.) Saxon, A.; Stevens, R. H.; Ashman, R. F.; Parker, N. H. (Univ. California Sch. Medicine, Los Angeles, CA 90024). *Clin. Immunol. Immunopathol.* 8(2):272-279; 1977.

Two patients with nongranulomatous ulcerative jejunoileitis with hypogammaglobulinemia were investigated to determine the nature of the immune defect responsible for hypogammaglobulinemia. Analysis of surface receptors revealed that both patients had an absolute number of bone marrow-derived (B) lymphocytes within the normal range. Both patients had an absolute and relative thymus-derived (T) lymphocytopenia. However, their T lymphocytes were capable of providing helper function for normal bone marrow-equivalent lymphocytes in immunoglobulin production. The B lymphocytes demonstrated an intrinsic defect in immunoglobulin production, which was not reversed by the addition of normal T lymphocytes. Neither patient had evidence of excess suppressor cells. Thus, both patients manifested similar dual immune defects, consisting of a qualitative B-lymphocyte block in immunoglobulin production and a quantitative T-lymphocyte deficiency.

2204 ISCHEMIC DISEASE OF THE SMALL BOWEL AND COLON ASSOCIATED WITH ORAL CONTRACEPTIVES.

(Eng.) Ghahremani, G. G.; Meyers, M. A.; Farman, J.; Port, R. B. (Evanston Hosp., 2650 Ridge Ave., Evanston, IL 60201). *Gastrointest. Radiol.* 2(3): 221-228; 1977.

The development of ischemic bowel disease in seven women taking oral contraceptives is reported. The ischemic changes, which involved the ileum in three patients and the colon in four patients, became reversible after conservative management and discontinuance of the agents. The radiologic features of ischemic disease in the small bowel and colon are remarkably similar. The characteristic changes are best visible on barium studies and include mucosal edema, superficial ulcerations, blunting of the valvulae and haustra, transverse ridging, marginal indentations or thumbprints due to submucosal edema and hemorrhage, and thickening of the intestinal wall causing separation of the adjacent loops. Evidence for spasm and irritability of the involved segments may also be seen at fluoroscopy. The subsequent disappearance of the ischemic changes in the above patients was the most important factor in establishing the diagnosis of reversible mesenteric vascular occlusion. It is suggested that conservative management with heparin, dextran infusion, and discontinuance of the contraceptive agent should be attempted in patients without signs of peritoneal irritation and radiographic findings of intestinal necrosis. The persistence or progression of the clinical and radiologic findings indicate the necessity for surgical intervention, because bowel infarction is often insidious when caused by venous occlusion.

2205 A PROSPECTIVE COMPARISON OF GASTRIC AND JEJUNOILEAL BYPASS PROCEDURES FOR MORBID OBESITY. (Eng.) Griffen, W. O. Jr.; Young, V. L.; Stevenson, C. C. (Univ. Kentucky Medical Center, 800 Rose St., Lexington, KY 40506). *Ann. Surg.* 186(4):500-509; 1977.

Gastric and jejunoileal bypass procedures for morbid obesity were compared in a randomized, prospective study of 59 patients. The gastric bypass was performed predominantly as a 90% gastric exclusion with a Roux-en-Y reconstitution. The jejunoileal bypass was an end-to-end anastomosis between 30 cm of jejunum and 25 cm of terminal ileum, the bypassed segment of small bowel being decompressed by an end-to-side ileocolostomy. There were 32 patients in the gastric group and 27 in the jejunoileal group. The two groups were comparable in age, preoperative weight, and height. There were no postoperative deaths, but the gastric bypass operation was associated with a slightly higher early complication rate (62.5% of the cases versus 48%), indicating that it is a more technically demanding procedure. Late sequelae were more prominent in the jejunoileal bypass group and included significant diarrhea in 56% and need for medication in 74%. Kidney stones and cholelithiasis also complicated the jejunoileal group and were not seen after gastric bypass. All patients showed fatty metamorphosis on the original liver biopsy. This had worsened in 75% of the jejunoileal group at 1 yr postoperatively, whereas it had improved or was stable in all patients in the gastric group. The results indicate that once the technique is perfected, gastric bypass is superior to jejunoileal bypass in the treatment of morbid obesity.

2206 CONGENITAL INTRINSIC DUODENAL OBSTRUCTION: A TWENTY-FIVE YEAR REVIEW. (Eng.) Wesley, J. R.; Mahour, G. H. (Children's Hosp. Los Angeles, Los Angeles, CA). *Surgery* 82(5):716-720; 1977.

Factors influencing the prognosis of congenital duodenal obstruction were assessed in 72 patients in whom this condition was diagnosed between 1951 and 1975. The survival rate was 55% during the first 15 yr of the study, but it increased to 88% during the last 10 yr. Factors important to this increased survival rate included earlier diagnosis and expeditious preoperative workup; expert administration of anesthesia; improved surgical technique with a greater awareness for common pitfalls, such as associated duodenal diaphragm or distal bowel atresia; frequent use of gastrostomy; use of parenteral nutrition; and better intensive nursing care.

2207 ADENOMAS (POLYPS) OF THE DUODENUM. (Rus.) Gasmaev, V. K.; Yakushin, V. I. (S. P. Botkin Central Inst. Advanced Training Physicians, Moscow, USSR). *Vestn. Rentgenol. Radiol.* (5):38-44; 1977.

2208 CELIAC MELANOSIS: TWO NEW CASES. (Fre.) Laine, F.; Ramiara, Y. (Hopital des Armees, Bordeaux, France). *Bordeaux Med.* 9(25):2019-2022; 1976.

2209 A CASE OF ILEAL ATRESIA AND ILEOCUTANEOUS FISTULA CAUSED BY AMNIOCENTESIS. (Eng.) Rickwood, A. M. K. (Children's Hosp., Western Bank, Sheffield, England). *J. Pediatr.* 91(2):312; 1977.

2210 NON-OCCLUSIVE ENTERIC GANGRENE ASSOCIATED WITH SEVERE UPPER GASTROINTESTINAL BLEEDING. (Eng.) Wiklund, L.; Grevsten, S.; Nilsson, F.; Norlen, B. J.; Rimsten, A. (Univ. Hosp., S-750 14 Uppsala, Sweden). *Acta Chir. Scand.* 142(8): 593-597; 1976.

2211 HEMORRHAGIC ENTEROPATHY. (Ger.) Brobmann, G. F.; van Lessen, H.; Springorum, H. W.; Thomas, C. (Chirurgischen Universitats-Klinik, Hugstetterstrasse 55, 7800-Freiburg, W. Germany). *Fortschr. Med.* 94(30):1736-1741; 1976.

2212 ALPHA-CHAIN DISEASE AND RELATED SMALL-INTESTINAL LYMPHOMA. REPORT OF A WHO MEETING OF INVESTIGATORS. (Eng.) Bernier, J. J. (World Health Organization Immunology, 1211 Geneva 27, Switzerland). *Arch. Fr. Mal. App. Dig.* 65(8): 591-607; 1976.

2213 ULTRASTRUCTURAL STUDIES OF INTESTINAL MUCOSA FROM CHILDREN WITH LYSOSOMAL STORAGE DISEASES [Abstract]. (Eng.) Vio, P. M. A.; Ginsel, L. A.; Daems, W. T.; van Gemund, J. J.; Cambier, P. H. (No affiliation given). *Acta Paediatr. Belg.* 29(2):135; 1976.

2214 OCCLUSIVE DISEASE OF THE MESENTERIC ARTERIES: A CLINICAL AND RADIOLOGICAL STUDY. (Eng.) Hansen, H. J. B.; Efsen, F. (Rigshospitalet, Univ. Hosp., Lundtoftevej 282, DK-2800 Lyngby, Denmark). *Dan. Med. Bull.* 24(3):117-122; 1977.

2215 PREVENTION AND TREATMENT OF MALFUNCTION OF THE CONTINENT ILEOSTOMY. (Eng.) Grotzinger, U.; Myrvold, H. E.; Kock, N. G. (Sahlgren's Hosp., Goteborg, Sweden). *Chir. Gastroenterol.* 10(4):401-403; 1976.

2216 G.I.P. RESPONSE TO A STANDARD GLUCOSE LOAD IN OBESE PATIENTS BEFORE AND AFTER THE SALMON PROCEDURE [Abstract]. (Eng.) Cleator, I. G. M.; Gourlay, R. H. (St. Paul's Hosp., Vancouver, British Columbia, Canada). *Gastroenterology* 72(5, Part 2):1039; 1977.

2217 MORPHOLOGIC AND BIOCHEMICAL INTESTINAL CHANGES AFTER JEJUNO-ILEAL BYPASS [Ab-

stract]. (Eng.) Daly, J. M.; Castro, G. A.; Akhtar, M.; Dudrick, S. J. (Univ. Texas Medical Sch. Houston, 6400 West Cullen St., Houston, TX 77030). *Gastroenterology* 72(5, Part 2):1042; 1977.

2218 COLONIC CONSERVATION OF CARBOHYDRATE IN JEJUNO-ILEAL BYPASS PATIENTS [Abstract]. (Eng.) Currier, B.; Levitt, M. D.; Buchwald, H.; Bond, J. H. (Veterans Admin. Hosp., Minneapolis, MN). *Gastroenterology* 72(5, Part 2):1042; 1977.

2219 LIVER DISEASE AND NUTRITION AFTER JEJUNO-ILEAL BYPASS FOR OBESITY [Abstract]. (Eng.) Whelan, G. (St. Vincent's Hosp., Melbourne, Australia). *Gastroenterology* 72(5, Part 2):1149; 1977.

2220 FATTY METAMORPHOSIS OF THE LIVER ASSOCIATED WITH JEJUNOILEAL BYPASS. REPORT OF FIVE CASES. (Eng.) Piepkorn, M. W.; Mottet, N. K.; Smuckler, E. A. (Sch. Medicine, Univ. Washington, Seattle, WA 98195). *Arch. Pathol. Lab. Med.* 101 (8):411-415; 1977.

2221 LITHOGENIC INDEX OF BILE AFTER JEJUNOILEAL BYPASS OPERATION FOR OBESITY. (Eng.) Sorensen, T. I. A.; Bruusgaard, A.; Pedersen, L. R.; Krag, E. (Herley Hosp., DK-2730 Copenhagen, Denmark). *Scand. J. Gastroenterol.* 12(4):449-451; 1977.

2222 THE EFFECT OF JEJUNOILEOSTOMY ON THE CONCENTRATION OF CERTAIN PLASMA LIPID FRACTIONS IN PATIENTS WITH EXTREME OBESITY. (Pol.) Tuszewski, M.; Smolinska, K. (Klinika Chirurgii Gastroenterologieznej Instytutu Chirurgii AM, ul. Przybyszewskiego 49, 60-355 Poznan, Poland). *Pol. Tyg. Lek.* 31(46):1975-1977; 1976.

See also, 1697, 1700, 1702, 1807, 1815, 1838, 1965, 1967, 1988, 1994, 1995, 1998, 2000, 2003, 2049, 2050, 2104, 2114, 2116, 2117, 2120, 2137, 2138, 2142, 2153, 2157, 2161, 2179, 2180, 2181, 2232, 2241, 2245, 2246, 2273, 2285, 2296, 2306, 2531, 2541, 2542, 2561, 2573, 2578, 2581, 2583, 2586, 2588, 2596, 2601, 2609, 2610, 2622, 2623.

SMALL INTESTINE

Malabsorption

2223 AMINO ACID AND PEPTIDE ABSORPTION IN PATIENTS WITH COELIAC DISEASE. (Eng.) Clark, M. L.; Fairclough, P. D.; Silk, D. B. A. (St. Bartholomew's Hosp., London, England). *Z. Ernaehrungswiss.* 20(Suppl.):32-37; 1977.

The absorption of amino acids and peptide was studied in adults to clarify the degree to which malabsorption of dietary protein contributes to the protein deficiency seen in some cases of celiac disease. Absorption of amino acids from perfused solutions was compared in eight normal subjects and seven patients with untreated celiac disease. The isotonic solutions contained the dipeptide glycyl-L-alanine (10 mM) or the same amino acids in the free form, 25 mM bicarbonate, and polyethylene glycol (PEG, 2.5 g/l), labeled with ^{14}C PEG (1 μCi/l). There was a significant reduction in absorption rates of both glycine and L-alanine from the mixture of free amino acids in the jejunum of celiacs when compared to the normal subjects ($p<0.02$). Mean total amino acid absorption in the celiac patients was reduced up to 40% of the control values. There was a significant ($p<0.001$) reduction in both glycine and L-alanine absorption from dipeptide solution in the celiacs. Comparable levels of free amino acids occurred in celiacs and normal subjects during jejunal perfusion of dipeptide, and there was no significant difference between luminal peptidase in both groups, indicating that back diffusion of free amino acids is increased in celiac disease. Ileal absorption of amino acids and peptide was normal in celiacs. The studies demonstrate that free amino acid and peptide absorption in the jejunum of celiac patients were impaired to the same degree. As total amino acid absorption was more rapid from dipeptide than from free amino acid solution, the use of peptide-containing elemental diets in celiac patients is recommended if rapidity of amino acid absorption is desirable.

2224 FACTORS RESPONSIBLE FOR WEIGHT LOSS IN TROPICAL SPRUE. (Eng.) Klipstein, F. A.; Corcino, J. J. (Univ. Rochester Medical Center, 601 Elmwood Ave., Rochester, NY 14642). *Am. J. Clin. Nutr.* 30(10):1703-1708; 1977.

The respective roles of reduced dietary intake and malabsorption in the pathogenesis of weight loss in 45 patients with chronic tropical sprue were evaluated. Dietary intake was significantly ($p<0.001$) less in the patients with tropical sprue (all of whom had anorexia due to deficiency of folate and/or vitamin B_{12}) than in 51 healthy Puerto Ricans. Weight loss was equally prominent in those patients with tropical sprue who had normal absorption of fat and protein as in those who had excessive fecal loss and reduced absorption of these nutrients.

Treatment of five sprue patients with folic acid or vitamin B_{12} for 2 weeks resulted in improved appetite and increase in dietary intake with weight gain in the absence of significant improvements in intestinal absorption. Treatment with p.o. tetracycline for a similar period of time in five other patients was not associated with vitamin repletion, return of appetite, or weight gain. These observations indicate that reduced dietary intake resulting from anorexia caused by vitamin deficiency is a significant, and sometimes the most important, factor in the pathogenesis of weight loss in persons with chronic tropical sprue.

2225 MALABSORPTION FOLLOWING RADIATION THERAPY. (Eng.) Burbige, E. J.; Tarder, G. L.; Belber, J. P. (Veterans Admin. Hosp., 150 Muir Rd., Martinez, CA 94553). *Am. J. Gastroenterol.* 67(6): 589-592; 1977.

The case is presented of a patient with transitional cell carcinoma of the bladder who developed diarrhea following radiotherapy and was treated symptomatically for 9 yr with the assumption that the diarrhea was secondary to radiation enteritis. Further evaluation, including endoscopic cholangiopancreatography, revealed pancreatic insufficiency with steatorrhea as the probable cause of the patient's diarrhea. Although temporally related to radiation therapy, the etiology of his pancreatic insufficiency remains speculative. All patients developing diarrhea and/or malabsorption following radiotherapy should be evaluated thoroughly for treatable causes.

2226 INTESTINAL MICROFLORA AND RESORPTION. (Ger.) Knoke, M.; Bernhardt, H. (Medizinischen Universitats-Klinik, Freiedrich-Loefler-Strasse 23a, 22 Greifswald, Germany). *Z. Gesamte Inn. Med.* 31(17):679-684; 1976.

2227 TRH INDUCED TSH RELEASE IN COELIAC DISEASE [Abstract]. (Eng.) Eggermont, E.; Vanderschueren-Lodeweyckx, M.; Molla, A.; Eeckels, R.; Malvaux, P.; Beckers, C. (No affiliation given). *Acta Paediatr. Belg.* 29(2):127; 1976.

2228 GASTRIC SECRETORY FUNCTION IN COELIAC DISEASE [Abstract]. (Eng.) Marcello, U.; Consolaro, G.; Zoppi, G. (No affiliation given). *Acta Paediatr. Belg.* 29(2):133; 1976.

2229 ULTRASTRUCTURAL LOCALIZATION OF IMMUNOGLOBULINS IN NORMAL AND COELIAC INTESTINAL MUCOSA USING PEROXIDASE-LABELLED ANTIBODIES [Abstract]. (Eng.) Jos, J.; Labbe, F. (No affiliation given). *Acta Paediatr. Belg.* 29(2):128; 1976.

2230 VITAMIN B_6 IN DUODENAL MUCOSA AND IN SERUM OF CHILDREN WITH COELIAC DISEASE [Abstract]. (Eng.) Reinken, L.; Zieglauer, H.; Berger, H. (No affiliation given). *Acta Paediatr. Belg.* 29(2):127-128; 1976.

2231 A COMPARISON OF THE IMMUNOPATHOLOGY OF MILK ALLERGY AND COELIAC DISEASE [Abstract]. (Eng.) Shiner, M.; Ballard, J.; Smith, M. (No affiliation given). *Acta Paediatr. Belg.* 29(2):127; 1976.

2232 HYPEROXALURIA IN CHILDREN WITH HEPATIC, PANCREATIC, AND INTESTINAL DYSFUNCTION [Abstract]. (Eng.) McCollum, J. P. K.; Ogilvie, D.; Muller, D. P. R.; Packer, J. S.; Harries, J. T. (No affiliation given). *Acta Paediatr. Belg.* 29 (2):133; 1976.

2233 THE EFFECT OF SUCROSE MALABSORPTION ON THE PATTERN OF GROWTH IN CHILDREN [Abstract]. (Eng.) Krasilnikoff, P. A.; Gudmand-Hoyer, E. (No affiliation given). *Acta Paediatr. Belg.* 29(2):132; 1976.

2234 A STUDY OF THE MOLECULAR ALTERATIONS IN CONGENITAL SUCROSE INTOLERANCE (CSI) AND CONGENITAL ENTEROKINASE DEFICIENCY (CED) [Abstract]. (Eng.) Schmitz, J.; Honegger, J.; Tarlow, M. J.; Hadorn, B.; Rey, J. (No affiliation given). *Acta Paediatr. Belg.* 29(2):130; 1976.

See also, 1732, 1965, 1996, 2031, 2120, 2154, 2156, 2303, 2322, 2466, 2546, 2549, 2583, 2598, 2609.

LARGE INTESTINE

2235 ADYNAMIC BOWEL SYNDROME: REPORT OF A CASE WITH DISTURBANCE OF THE CHOLINERGIC INNERVATION. (Eng.) Puri, P.; Lake, B. D.; Nixon, H. H. (Hosp. Sick Children, London, England). *Gut* 18(9):754-759; 1977.

The case of an infant with adynamic bowel syndrome is described. Full thickness biopsies of the large bowel showed the presence of ganglion cells; no acetylcholinesterase-positive nerves in the lamina propria, submucosa, or among the smooth muscle cells of the circular and longitudinal muscle coats; and absence of the argyrophil plexus. Electron microscopy showed replacement of the normal axon

bundle by vacuolated tracts with small round bodies, probably viral, in one area. Neuronal cytoplasm also showed similar vacuolation. The patient was successfully treated with an ascending colon loop colostomy, which was later transformed to an end ileostomy. It is suggested that the damage to the cholinergic innervation may be caused by a neurotoxic agent.

2236 ANGIODYSPLASIA OF THE RIGHT COLON: A CAUSE OF GASTROINTESTINAL BLEEDING. (Eng.) Baum, S.; Athanasoulis, C. A.; Waltman, A. C.; Galdabini, J.; Schapiro, R. H.; Warshaw, A. L.; *et al.* (Hosp. Univ. Pennsylvania, 3400 Spruce St., Philadelphia, PA 19104). *Am. J. Roentgenol.* 129(5): 789-794; 1977.

Clinical experience with angiodysplasia of the right colon and cecum in 34 patients is presented, and the diagnostic importance of mesenteric arteriography in patients with chronic lower intestinal bleeding is emphasized. The patients had intermittent lower gastrointestinal bleeding and were diagnosed angiographically as having angiodysplasia of the cecum or right colon. Repeated barium and endoscopic examinations were negative. Right colectomy was carried out in 17 patients, who were followed postoperatively for up to 7 yr. Of these, four patients rebled, two of whom had angiographic evidence of related lesions involving other parts of the colon and terminal ileum. Silicone rubber injection and tissue-clearing techniques on the specimens facilitated the pathologic identification of these lesions. Histologically, they were seen to be dilated submucosal veins and arteries associated with areas of overlying mucosal thinning and occasional ulcerations. Although the pathogenesis of the lesion is unknown, they are probably acquired rather than congenital and result from chronic submucosal arteriovenous shunting secondary to mucosal ischemia. Of the 34 patients, 17 had a history of cardiac disease.

2237 FEASIBILITY OF FECAL OCCULT-BLOOD TESTING FOR DETECTION OF COLORECTAL NEOPLASIA: DEBITS AND CREDITS. (Eng.) Winawer, S. J.; Miller, D. G.; Schottenfeld, D.; Leidner, S. D.; Sherlock, P.; Befler, B.; *et al.* (Memorial Sloan-Kettering Cancer Center, 1275 York Ave., New York, NY 10021). *Cancer* 40(5, Suppl.):2616-2619; 1977.

A screening program for colorectal cancer and adenomas was applied to 6,579 mostly asymptomatic men and women age 40 yr and older utilizing fecal occult blood testing followed by investigation of patients with positive slides by air-contrast barium enema and colonoscopy. A control population of 7,325 patients had sigmoidoscopy only and no occult blood testing. Approximately 1% of the patients had positive slides; most patients had only one or two positive slides. Approximately 50% of patients with positive slides had significant neoplastic lesions, including 23 patients with large adenomas and 7 patients with cancers. Pathological staging of cancer was more favorable in the screened asymptomatic group as compared with the control group. Neoplastic lesions seen on sigmoidoscopy in screened patients who had negative fecal occult blood tests included 2 cancers and 15 large adenomas. The false-negative results may have been due to conversion of initially positive slides to negative. Screening for colorectal cancer and adenomas with fecal occult blood testing appears to be a feasible approach with good patient compliance, and a manageable rate of positive slides productive of a high percentage of neoplastic lesions. The number of false-positives seems to be low.

2238 AGE-RELATED IMPAIRMENT OF TUMOR-ASSOCIATED LYMPHOCYTOTOXICITY IN PATIENTS WITH COLONIC ADENOCARCINOMA. (Eng.) Goldrosen, M. H.; Rohrdanz, D.; Sabatino, B.; Burns, G. P.; Holyoke, E. D. (Roswell Park Memorial Inst., New York State Dept. Health, 666 Elm St., Buffalo, NY 14263). *Dis. Colon Rectum* 20(7):561-565; 1977.

The *in vitro* lymphocytotoxic responses of 27 preoperative patients with colon carcinoma and 61 healthy volunteers were correlated with age by linear regression analysis. The patients ranged in age from 34 to 88 yr (average 61.7), and the controls ranged from 16 to 88 yr (average 45.8). Cytotoxicity obtained with WBC from the cancer patients on the colonic cancer-cell line decreased with increasing age ($r=0.66$, $p \leq 0.01$). In contrast, cytotoxicity obtained with WBC from the controls on the same cell line did not correlate with age of the donor. Furthermore, the decline in cytolysis in the patient group could not be attributed to more extensive disease. These observations suggest that increasing age is an important factor associated with the decline in ability of colorectal cancer patients to generate a disease-related cytolytic reaction.

2239 ULTRASTRUCTURE OF THE "TRANSITIONAL" MUCOSA ADJACENT TO LARGE BOWEL CARCINOMA. (Eng.) Riddell, R. H.; Levin, B. (Univ. Chicago Hosp. and Clinics, 950 East 59th St., Chicago, IL 60637). *Cancer* 40(5, Suppl.):2509-2522; 1977.

The transitional mucosa immediately adjacent to large bowel carcinoma was examined in 13 patients by scanning electron microscopy (SEM), and the results were correlated with those of transmission electron microscopy (TEM) and of light microscopy (LM). Marked abnormalities, including distortion and loss of the normal architecture, were present in this mucosa in nine patients. In all patients, the transitional mucosa was compared with two pieces of normal mucosa; in one patient, typical changes of transitional mucosa were found in this region. In the remaining patients, normal mucosa by SEM was found to consist of large deep furrows (primary crypts) as well as the crypts of Lieberkuhn (secondary crypts). The secondary crypt structure showed marked individual variation between patients, but one type was present in nine patients. It is uncertain whether this is a pattern with a high incidence in the general population, or whether pa-

tients with this type of mucoşa are particularly predisposed to large bowel carcinoma. SEM may, therefore, play a part in identifying patients particularly likely to develop large bowel carcinoma.

2240 ANTIBIOTIC-INDUCED COLITIS: IMPLICATION OF A TOXIN NEUTRALISED BY Clostridium sordellii ANTITOXIN. (Eng.) Rifkin, G. D.; Fekety, F. R.; Silva, J., Jr.; Sack, R. B. (Univ. Hosp., Ann Arbor, MI 48109). *Lancet* 2(8048):1103-1106; 1977.

The feces of two patients with antibiotic-induced colitis were examined for the presence of toxin(s). A heat-labile toxin(s) was demonstrated in the stools of both patients. This toxin(s) was rapidly lethal to hamsters, increased the vascular permeability in rabbit skin, and was cytotoxic to cells in tissue culture. It was neutralized by *Clostridium sordellii* antitoxin but not by antitoxins prepared against other clostridia or against *Escherichia coli* and *Vibrio cholerae* toxins. These characteristics were identical to those of a toxin implicated in the etiology of antibiotic-induced colitis in the hamster. One patient improved rapidly after treatment with p.o. vancomycin, and at the same time the toxin disappeared from the stool.

2241 ISCHEMIC BOWEL DISEASE FOLLOWING BILATERAL NEPHRECTOMY OR RENAL TRANSPLANT. (Eng.) Margolis, D. M.; Etheredge, E. E.; Garza-Garza, R.; Hruska, K.; Anderson, C. B. (Barnes and Wahl Hosp., 4960 Audubon Ave., St. Louis, MO 63110). *Surgery* 82(5):667-673; 1977.

The case reports of five patients who developed pathologically proved ischemic bowel disease (IBD) following either renal transplantation or bilateral nephrectomy in preparation for transplantation during a 2-yr period are presented. This entity accounted for 42% of all major gastrointestinal complications in one transplant unit. Three patients presented with abdominal pain and ileus, and two patients developed massive lower gastrointestinal hemorrhage. All five patients had nonocclusive ischemic disease because obstruction of a major intestinal vessel could not be documented in any case. Each patient was treated with bowel resection, and three of the five patients survived. Although sepsis, shock, and large doses of immunosuppressive drugs have been implicated in predisposing such patients to IBD, these factors were not uniformly present in these cases. Blood volume redistribution with transient episodes of hypotension, especially during postoperative hemodialysis, may be significant. IBD in uremic patients can occur in the presence or absence of renal transplantation and may be the cause of massive intestinal hemorrhage in these individuals.

2242 VALUE OF A SINGLE FORCEPS BIOPSY OF COLONIC POLYPS. (Eng.) Livstone, E. M.; Troncale, F. J.; Sheahan, D. G. (Yale Univ. Sch. Medicine, 333 Cedar St., New Haven, CT 06510). *Gastroenterology* 73(6):1296-1298; 1977.

The accuracy of colonoscopic biopsies in predicting the histological diagnosis of colonic polyps removed at colonoscopy or at laparotomy was studied in 42 patients who were colonoscoped before the removal of 50 polyps. A single fractional biopsy was obtained from each lesion with the standard endoscopic biopsy forceps and was compared to the final histological diagnosis of each excised lesion. The fractional biopsy measured 2-3 mm in diameter in each case. Thirteen (26%) of the singular fractional biopsies did not demonstrate the significant histological features of the excised polyps. These tiny biopsies do not adequately represent the entire polyp. Moreover, the small size of the biopsy does not permit the study of the central submucosal area of the polyp stalk, the critical area for assessing invasive malignancy. Histological examination of a completely excised polyp is essential for accurate diagnosis and appropriate therapy.

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(W. W. Cross Cancer Inst., Edmonton, Alberta, Canada). *Clin. Res.* 25(5):687A; 1977.

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See also, 1967, 1984, 1995, 2021, 2041, 2047, 2050, 2121, 2204, 2211, 2218, 2232, 2287, 2290, 2291, 2293, 2294, 2295, 2296, 2501, 2541, 2542, 2553, 2558, 2569, 2570, 2573, 2578, 2581, 2586, 2609, 2610, 2619, 2622, 2625, 2626.

2287 SEVERE COLITIS IN CHILDREN AND ADOLESCENTS: DIAGNOSIS, COURSE, AND TREATMENT. (Eng.) Werlin, S. L.; Grand, R. J. (Harvard Medical Sch., Boston, MA). *Gastroenterology* 73(4, Part 1):828-832; 1977.

Nineteen children with severe colitis (14 with ulcerative colitis and 5 with Crohn's colitis) were analyzed according to newly established criteria. There were 8 boys and 11 girls (mean age 12.3 ± 3.8 yr), and duration of acute illness ranged from 2 to 56 days at the time of presentation. Six episodes responded to medical management within 12 days; one episode responded at 3 weeks, one at 4 weeks, and one had not responded when the patient was lost to follow-up. Extending the period of medical treatment beyond 12 days substantially increased morbidity and complications of therapy. No combination of criteria accurately predicted those patients who would respond to medical therapy alone. Ten episodes unresponsive to medical treatment required surgery for control of disease. Of nine patients initially treated with medical therapy alone, five required proctocolectomy for intractable disease in the 2-yr period after the severe attack; three others are doing poorly on a medical regimen (1.5-2.5 yr later), and only one is in remission (5 yr after the severe attack). The data demonstrate that 32% of children with severe colitis had a rapid response to medical management, but the remission achieved was short-lived. The majority of pediatric patients with severe colitis require surgery within 2 yr of the onset of the attack.

2288 THE DETECTION OF SEROLOGICAL FACTORS IN ACUTE ULCERATIVE COLITIS INDICATING A FAVOURABLE SHORT-TERM PROGNOSIS. (Eng.) Hunt, P. S.; Trotter, S. (Prince Henry's Hosp., St. Kilda Rd., Melbourne, Victoria 3004, Australia). *Aust. N.Z. J. Surg.* 46(1):88-91; 1976.

The significance of a possible interplay between autologous serum and lymphocytes in relation to the short-term natural history of acute ulcerative colitis was investigated. Large intestinal epithelial cells were obtained from surgical specimens and by biopsy at sigmoidoscopy from 16 patients with acute severe mucosal ulcerative colitis and 11 controls with normal large bowel mucosa. The ability of lymphocytes to release ^{51}Cr label from large intestinal epithelial cells was quantitatively assessed as percentage lymphocyte activity. The mean lymphocyte activity in 16 patients with acute ulcerative colitis on admission (88 ± 8%) was significantly greater than that in 11 normal subjects (16 ± 8%, $p<0.01$). In each study, samples of autologous serum were added to two reactions between lymphocytes and autologous large intestinal epithelial cells. The results in the seven patients who came to urgent colectomy differed significantly from those in the nine who responded to corticosteroids (44 ± 16% versus 12 ± 5%). When the serum of these patients was studied for immunofluorescent autoantibodies to normal human colonic mucosa, none of the seven patients treated by colectomy had detectable autoantibodies, as compared with three of the nine patients who responded to steroid treatment. The results support a previous suggestion that serological factors (i.e., anticolon antibodies) may account for the remissions and exacerbations of ulcerative colitis.

2289 FURTHER STUDIES OF SULPHASALAZINE METABOLISM IN THE TREATMENT OF ULCERATIVE COLITIS. (Eng.) Cowan, G. O.; Das, K. M.; Eastwood, M. A. (Western General Hosp., Edinburgh EH4 2XU, Scotland). *Br. Med. J.* 2(6094):1057-1059; 1977.

Sixty-four outpatients receiving maintenance treatment with sulphasalazine for ulcerative colitis were studied to relate disease activity to serum concentrations of sulphapyridine. Of 43 patients in remission, 32 had serum sulphapyridine levels >20 µg/ml. Ten of the 21 patients with active disease were taking inadequate doses of sulphasalazine, as indicated by low serum sulphapyridine levels, and of the remaining 11 patients who had serum levels >20 µg/ml, 9 had fecal stasis proximal to active distal colitis and went into remission when treated with hydrophilic colloid or bran and an unchanged sulphasalazine dosage. This suggests that to be effective the metabolites of sulphasalazine must be delivered in the feces to the lumen of the diseased distal segment of the colon. Because high serum concentrations of sulphapyridine produce side-effects, slow acetylators of sulphapyridine need lower doses of sulphasalazine. Estimations of serum sulphapyridine concentrations, as well as identifying the patient's acetylation phenotype, can also be useful in assessing whether the patient is taking the medication at regular intervals.

2290 CANCER IN COLITIS: ASSESSMENT OF THE INDIVIDUAL RISK BY CLINICAL AND HISTOLOGICAL CRITERIA. (Eng.) Lennard-Jones, J. E.; Morson, B. C.; Ritchie, J. K.; Shove, D. C.; Williams, C. B. (St. Mark's Hosp., City Rd., London ECIV 2PS, England). *Gastroenterology* 73(6):1280-1289; 1977.

To test the concept that histological examination of sequential biopsy specimens can detect patients with colitis who are at special risk of developing cancer, the cancer risk among 229 patients with extensive ulcerative colitis observed during January 1, 1966 to February 29, 1976 was correlated with the length of history and the histological findings in rectal and colonic biopsies. Five patients are known to have developed carcinoma. No carcinoma was observed in 578 patient-years of follow-up within 10 yr of onset of the colitis, but the risk in the second decade was approximately 1 in 200 patient-years and, in the third, 1 in 60

patient-years. Severe epithelial dysplasia was rare and was found in 32 biopsies from 13 patients. No carcinoma has occurred during the period of follow-up in patients without dysplasia. It was not possible to follow the development of dysplasia in sequential biopsies. Seven patients with consistent severe dysplasia on biopsy have been treated surgically; carcinoma confined to the bowel wall (Dukes' A) was found in four patients. A scheme of management for patients with extensive colitis, including regular rectal and colonic biopsies, is proposed. The results suggest that such a program will isolate a small group of patients who require surgical treatment for established precancerous change or carcinoma with a high likelihood of cure.

2291 EARLY DETECTION AND PREVENTION OF CARCINOMA OF THE COLON IN PATIENTS WITH ULCERATIVE COLITIS. (Eng.) Dobbins, W. O., III; Stock, M.; Ginsberg, A. L. (2150 Pennsylvania Ave., N.W., Washington, DC 20037). *Cancer* 40(5, Suppl.):2542-2548; 1977.

The available methods for the early detection and prevention of colonic carcinoma in patients with ulcerative colitis are reviewed. These methods include detection of precancer (carcinoma *in situ*) in rectal and colonic biopsies, with and without immunoperoxidase staining for carcinoembryonic antigen; detection of persistently elevated serum carcinoembryonic antigen; roentgenologic detection; colonoscopic detection; cytologic detection; and simple recommendation of total colectomy in all patients with continuously active, extensive colitis after 10 yr of disease. Of the methods available, only detection of precancer in rectal and colonic biopsies holds promise for the early detection of colonic carcinoma, and there are many pitfalls with this method. Precancer, when analyzed in total colectomies, is absent in 12% of patients with carcinoma complicating ulcerative colitis and is found in the rectum in only 66% of these patients. Thirteen percent of patients with severe ulcerative colitis requiring colectomy have precancer in the absence of cancer. Precancer, when analyzed in rectal biopsies of patients with ulcerative colitis, is found in 5.7% of the patients. One study showed that 32% of those patients with precancer in rectal biopsy had colonic carcinoma, while two-thirds of these patients did not have colonic cancer. The role of colonoscopy at regular intervals with the collection of multiple biopsies throughout the colon is currently being evaluated in hopes that this method will more accurately and consistently permit early detection of precancer and cancer in patients with ulcerative colitis of 10 or more years' duration.

2292 HUMORAL IMMUNE SYSTEM IN INFLAMMATORY BOWEL DISEASE: I. COMPLEMENT LEVELS. (Eng.) Hodgson, H. J. F.; Potter, B. J.; Jewell, D. P. (Royal Free Hosp., London, England). *Gut* 18(9):749-753; 1977.

Serum levels of complement components C1q, C4, C3, and Properdin factor B, from the classical and alternative pathways of complement activation, were estimated in 93 patients with ulcerative colitis and 66 patients with Crohn's disease. C3, factor B, and, to some extent, C4 concentrations all increased when the disease was active. In remission, the levels of these components did not differ from those in 31 hospital control patients. There was no evidence for the preferential consumption of the proteins of either pathway of activation, even in those patients with evidence of circulating immune complexes.

2293 ULCERATIVE COLITIS, ANTI-B LYMPHOCYTOTOXIN AND ANTICOLON ANTIBODIES IN A PATIENT WITH HUMORAL IMMUNODEFICIENCY: DIGESTIVE AND IMMUNOLOGIC INVESTIGATIONS [Abstract]. (Eng.) Matuchansky, C.; Messing, B.; Turcz, T.; Galian, A.; Preud'homme, J. L.; Bernier, J. J. (Hopital St-Lazarre, Paris, France). *Digestion* 16(1/2):215; 1977.

2294 RISK OF CANCER IN ULCERATIVE COLITIS [Abstract]. (Fre.) Devroede, G. (No affiliation given). *Cancer Immunol. Immunother.* 3(Suppl.):S8; 1977.

2295 SULPHASALAZINE RECTAL ENEMAS: TOPICAL METHOD OF INDUCING REMISSION OF ACTIVE ULCERATIVE COLITIS AFFECTING RECTUM AND DESCENDING COLON. (Eng.) Serebro, H.; Kay, S.; Javett, S.; Abrahams, C. (Brenthurst Clinic, Parktown, Johannesburg, South Africa). *Br. Med. J.* 2(6097):1264; 1977.

2296 "BACKWASH ILEITIS" WITH PSEUDOPOLYPOSIS. (Eng.) Gardiner, G. A. (Loma Linda Univ. Sch. Medicine, Loma Linda, CA 92354). *Am. J. Roentgenol.* 129(3):506-507; 1977.

See also, 2278, 2628.

PANCREAS

2297 NEEDLE ASPIRATION BIOPSY OF THE PANCREAS AT LAPAROTOMY. (Eng.) Kline, T. S.; Abramson, J.; Goldstein, F.; Neal, H. (Lankenau Hosp., Lancaster and City Line Ave., Philadelphia,

PA 19151). *Am. J. Gastroenterol.* 68(1):30-33; 1977.

Six years of experience with thin needle aspiration biopsies obtained from the pancreas during laparotomy on 56 patients is presented. An 18- to 22-gauge spinal needle attached to a disposable syringe was used. The specimens were fixed immediately and stained according to the method of Papanicolaou. The accuracy was 94% for 36 carcinomas and there were no false-positives in the 20 benign lesions. In this series, 21/56 had rapid diagnosis by this method during surgery and in 4, the Whipple operation was performed successfully. The safety, ease of interpretation, and high accuracy of this method make this an extremely useful procedure.

2298 PANCREATIC CANCER SCREENING: ANALYSIS OF THE PROBLEM AND THE ROLE OF RADIONUCLIDE IMAGING. (Eng.) Hall, T. J.; Cooper, M.; Hughes, R. G.; Levin, B.; Skinner, D. B.; Moossa, A. R. (Univ. Chicago, Pritzker Sch. Medicine, Chicago, IL). *Am. J. Surg.* 134(5):544-548; 1977.

The clinical, surgical, and pathologic findings in a 5-yr prospective study of 192 patients referred with a high probability of pancreatic cancer are reported. The requirements of any pancreatic imaging procedure were defined as its ability to distinguish a normal pancreas from pancreatic cancer or chronic pancreatitis and the capability of detecting tumors <5 cm in diameter. There was a 47% incidence of pancreatic disease (27% pancreatic cancer and 20% chronic pancreatitis). Prospective radionuclide imaging (^{75}Se-selenomethionine) was of little clinical value in this patient population; it was neither specific nor sensitive to pancreatic cancer or chronic pancreatitis. Preliminary data with longitudinal multiplane emission tomography show an improved diagnostic accuracy and the ability to detect resectable tumors, but its efficacy needs to be prospectively compared with other screening tests on a carefully defined patient population.

2299 THE PROSPECTIVE EVALUATION OF TUMOUR-ASSOCIATED ANTIGENS FOR THE EARLY DIAGNOSIS OF PANCREATIC CANCER. (Eng.) Wood, R. A. B.; Moossa, A. R. (Ninewells Hosp. and Medical Sch., Dundee, Scotland). *Br. J. Surg.* 64(10):718-720; 1977.

In a study of the validity of assaying tumor-associated antigens for the early diagnosis of pancreatic cancer, blood was obtained from 136 unselected patients suspected of having a major intra-abdominal pathological condition and was stored as serum. A definitive histological diagnosis was made in all cases, usually by laparotomy. Thirty-eight patients had pancreatic cancer. The serum was analyzed with coded samples for carcinoembryonic antigen, alpha fetoprotein, and pancreatic oncofetal antigen, and all recorded levels above the upper limit of normal for that test were taken as positive results (≥5.0 ng/ml and ≥40 ng/ml for carcinoembryonic antigen and alpha fetoprotein, resp.; oncofetal antigen was graded on a 0 to +++ scale, with ≥+ taken as a positive result). The results were analyzed to give the predictive value of a positive test and of a negative test for each antigen. A negative pancreatic oncofetal antigen test was found to be useful in excluding a diagnosis of pancreatic cancer; it gave a negative result in 94% of patients without pancreatic cancer.

2300 LOCALIZATION OF GLUCAGONOMAS BY CATHETERIZATION OF THE PANCREATIC VEINS AND WITH GLUCAGON ASSAY. (Eng.) Ingemansson, S.; Holst, J.; Larsson, L. I.; Lunderquist, A. (Bispebjerg Hosp., Copenhagen, Denmark). *Surg. Gynecol. Obstet.* 145 (4):509-516; 1977.

Experiments were carried out in two patients with glucagonomas to determine whether glucagonomas could be detected preoperatively by determining differences in arteriovenous glucagon. Percutaneous transhepatic puncture of the portal vein and catheterization of the pancreatic veins were performed simultaneously with catheterization of the inferior vena cava and abdominal aorta. Blood samples obtained from the vena cava, aorta, and portal branches were assayed for glucagon, using an indirect immunohistochemical method. In both patients, significant arteriovenous glucagon differences allowed preoperative localization of the tumors; in the celiac artery, hepatic vein, and main portal vein, the decrease in glucagon levels from the preoperative to postoperative state was significant ($p<0.001$). A comparison with other localization techniques, such as scintiscan, ultrasound, arteriography, and pancreatic phlebography, showed the present method to be superior. Postoperatively, the same investigations were performed revealing arterial and venous glucagon levels comparable to the levels measured in a reference group of three patients without glucagonomas. The triple catheterization technique is advocated for all patients with clinical and laboratory findings that suggest pancreatic endocrine tumors.

2301 BILE SALT KINETICS IN CYSTIC FIBROSIS: INFLUENCE OF PANCREATIC ENZYME REPLACEMENT. (Eng.) Watkins, J. B.; Tercyak, A. M.; Szczepanik, P.; Klein, P. D. (Children's Hosp. Medical Center, 300 Longwood Ave., Boston, MA 02115). *Gastroenterology* 73(5):1023-1028; 1977.

Bile acid kinetics were investigated by a stable isotope-dilution technique in six children (ages 3.5 months to 4.5 yr) with previously untreated cystic fibrosis. All patients had malabsorption, normal intestinal mucosal function (as judged by glucose absorption), intestinal histology, disaccharidase levels, and normally functioning gallbladders. The children were maintained on a constant diet throughout the study period; fat intake averaged 4.2 g/kg/day. Before the administration of pancreatic enzyme replacement, fat excretion equalled 50 ± 4% of intake and was reduced to 20 ± 1.0% of intake after therapy. The total bile acid pool size nearly doubled during enzyme replacement from 379 ± 32 μmol/kg to 620 ± 36 μmol/kg with secondary bile acids comprising 57% of the

total pool before therapy and 40% after therapy. Total bile acid synthesis changed little with therapy, equaling 139 ± 17 μmol/kg/day (total 602 ± 109 mg/day) without enzyme replacement and 125 ± 19 μmol/kg/day (total 470 ± 86 mg/day) with enzyme replacement. This result was confirmed by the fecal excretion of bile acids: 545 ± 166 mg of bile acid/day were excreted without enzymes as compared to 513 ± 146 mg/day with enzymes. After therapy, the fractional turnover rate of the bile acid pool was reduced from 0.602 ± 0.05/day to 0.233 ± 0.03/day for cholic acid and from 0.696 ± 0.09/day to 0.39 ± 0.04/day for chenodeoxycholic acid. These data indicate that both primary and secondary bile acids are conserved within the enterohepatic circulation during enzyme therapy, and that the mechanism for the regulation of hepatic bile acid synthesis is intact in cystic fibrosis. However, the demonstration that large amounts of bile acid continue to be excreted during therapy suggests that interruption of the enterohepatic circulation continues and that deficiencies of the intraluminal phase may persist during enzyme therapy in this disease.

2302 ABNORMAL BILIARY LIPID COMPOSITION IN CYSTIC FIBROSIS: EFFECT OF PANCREATIC ENZYMES. (Eng.) Roy, C. C.; Weber, A. M.; Morin, C. L.; Combes, J. C.; Nussle, D.; Megevand, A.; *et al.* (Hopital Ste. Justine, 3175 Ste. Catherine Rd., Montreal, Quebec H3T 1C5, Canada). *N. Engl. J. Med.* 297(24):1301-1305; 1977.

Because of the increased incidence of gallstones in cystic fibrosis, biliary lipid composition was compared in 26 patients with cystic fibrosis, 7 children with cholelithiasis but without cystic-fibrosis, and 13 controls. Eighteen of the cystic fibrosis patients had cholecystograms; only one had gallstones. In 14 patients with cystic fibrosis who had stopped taking pancreatic enzymes for 1 week, the mean molar percentage of lipid composition accounted for by cholesterol (16.3 ± 2.9%) and the saturation index (2.0 ± 0.3) were comparable to values of the cholelithiasis group and higher ($p<0.01$) than those of controls. In 12 patients with cystic fibrosis taking pancreatic enzymes, the mean molar percentage of cholesterol (8.6 ± 1.7%) and the saturation index (1.0 ± 0.1) did not differ from those of controls; in cystic fibrosis there was a preponderance of cholic over chenodeoxycholic acid both off (1.7 ± 0.2%) and on (1.9 ± 0.3%) therapy as compared to the cholelithiasis (0.7 ± 0.1%) and control (0.8 ± 0.0%) groups. The glycine/taurine ratio of conjugated bile acids was lower in enzyme-treated patients with cystic fibrosis (3.7 ± 0.6) than in patients off treatment (6.4 ± 1.0), but was higher ($p<0.01$) than in controls (1.8 ± 0.2). Bile is lithogenic in untreated cystic fibrosis patients, but responds to pancreatic enzymes.

2303 INFLUENCE OF LYOPHILIZED TOTAL PANCREAS ON PLASMA LIPIDS AND ON FAT ABSORPTION IN CYSTIC FIBROSIS. (Eng.) Malmendier, C. L.; Van den Bergen, C. J.; Baran, D. (St. Pierre Univ. Hosp., 322 Rue Haute, 1000 Brussels, Belgium). *Helv. Paediatr. Acta* 32(2):115-128; 1977.

The effects of a lyophilized pancreatic powder preparation on the plasma lipid concentration, on the fatty acid composition of neutral lipids (NL), triglycerides (TG), cholesteryl esters (CE), and phospholipids (PL), and on the coefficient of fat absorption were studied in 31 children with cystic fibrosis (CF) and pancreatic insufficiency and in 27 controls to evaluate the treatment. The children were subdivided into three groups according to their age, and lipids were studied before and after the treatment. The CF children had marked decreases in total lipids, cholesterol, TG, and PL content. Treatment with lyophilized pancreas normalized the mean values of PL but only slightly increased total cholesterol. Polyunsaturated fatty acids (PUFA) increased in NL, TG, and PL in normal children, whereas saturated (C16:0 and C18:0) and mono-unsaturated (C16:1 and C18:1) fatty acids increased in CF children; differences were more pronounced in NL and CE than in PL. The arachidonic/linoleic ratio was normal in CF children, suggesting no abnormality in desaturation of fatty acids at this step in metabolism. Treatment with total pancreas extract raised PUFA content (C18:2 and C20:4) in NL, CE, and TG in CF children. The mean fat absorption coefficient was 94.8 ± 1.5% in normal children as compared to 65 ± 7.6% in CF children ($p<0.001$). Treatment with lyophilized pancreas extract increased this coefficient in CF children to 82.5 ± 5.6% ($p<0.01$). In conclusion, treatment of CF patients with lyophilized pancreas normalized PL plasma concentration but corrected only to a limited degree cholesterol concentration and PUFA percentage. It is suggested that the significant correlation found between the fat absorption coefficient and PUFA percentage in NL of CF children may be used as an index of the stage of malabsorption.

2304 PANCREAS DIVISUM: ITS ASSOCIATION WITH PANCREATITIS. (Eng.) Gregg, J. A. (110 Francis St., Boston, MA 02215). *Am. J. Surg.* 134(5):539-543; 1977.

Experience with 33 patients with pancreas divisum studied by endoscopic retrograde cholangiopancreatography (ERCP) are described. Pancreatitis was present in 15 patients, and another 11 had recurrent episodes of pain typical of pancreatitis. The major papilla was cannulated in all patients, but the duct of Wirsung was opacified in only 28 and showed changes of pancreatitis in 1. Attempts were made to cannulate the minor papilla in 15 of the 33 patients and were successful in 4. The duct of Santorini showed typical changes of pancreatitis in one case. One patient had pancreatic cancer, and the duct of Wirsung demonstrated only nonspecific abnormalities. In only two cases was pancreatitis due to alcohol abuse. The high incidence of pancreatitis and pancreatic-like pain in patients with pancreas divisum may be due to the very small ampulla of the duct of Santorini, which in these patients drains the majority of the pancreas, creating a marked relative stenosis of the

ampulla. Surgery for relief of pain was required in five patients. The operation of choice, when pancreatitis involves the dorsal pancreas, appears to be distal resection with drainage.

2305 COMPARATIVE EFFECTS OF ANTACIDS, CIMETIDINE AND ENTERIC COATING ON THE THERAPEUTIC RESPONSE TO ORAL ENZYMES IN SEVERE PANCREATIC INSUFFICIENCY. (Eng.) Regan, P. T.; Malagelada, J. R.; DiMagno, E. P.; Glanzman, S. L.; Go, V. L. W. (Mayo Clinic and Mayo Foundation, Rochester, MN 55901). *N. Engl. J. Med.* 297(16):854-858; 1977.

The effects of various treatments on fecal fat and nitrogen balance and on duodenal recovery of ingested pancreatic enzymes were evaluated in six patients with advanced pancreatic insufficiency to provide a rational basis for pancreatic enzyme replacement therapy after a solid test meal. The combination of cimetidine and pancreatin (300 mg and 2.5 g, resp., p.o.) produced significantly higher postprandial duodenal recoveries and concentrations of trypsin and lipase ($p<0.05$). Steatorrhea was reduced in all patients and abolished in four of the six. In the dosages used, neither enteric-coated enzymes nor supplemental neutralizing antacids were more effective than pancreatin alone in decreasing steatorrhea or improving duodenal enzyme delivery. Cimetidine may be a useful adjunct to p.o. pancreatic extract therapy in some patients with severe pancreatic insufficiency who fail to respond to pancreatic enzyme replacement alone. No side-effects attributable to cimetidine were noted.

2306 REGIONAL PANCREATECTOMY: EN BLOC PANCREATIC, PORTAL VEIN AND LYMPH NODE RESECTION. (Eng.) Fortner, J. G.; Kim, D. K.; Cubilla, A.; Turnbull, A.; Pahnke, L. D.; Shils, M. E. (Memorial Sloan-Kettering Cancer Center, 1275 York Ave., New York, NY 10021). *Ann. Surg.* 186(1):42-50; 1977.

Experience with 18 patients who had a regional pancreatectomy is presented. The pancreatic segment of portal vein was excised with the en bloc total pancreatectomy and regional lymph node dissection in all patients. Venous repair was by end-to-end anastomosis without a graft. Five patients also had various arterial resections and reconstructions. Sixteen of the 18 had been explored and deemed nonresectable in other institutions. This operation has doubled the resectability rate in the authors' institution. The 30-day operative mortality rate was 16.6%. Actuarial survival is 62% at 1 yr compared with a 36% 1-yr survival rate for patients undergoing pancreaticoduodenectomy for less advanced cancer in previous years. A more valid comparison would be between those who had a palliative procedure, since most patients in the present series were initially considered unresectable. One-year survival for these patients was 22%. The quality of life was good for most patients.

2307 ANALYSIS OF PANCREATIC FUNCTION THROUGH FECAL CHYMOTRYPSIN DETERMINATION AND SECRETIN-PANCREOZYMIN TEST: A COMPARATIVE STUDY. (Ger.) Tympner, F.; Reiner, T.; Domschke, W. (Med. Univ.-Klinik, Krankenhausstrasse 12, 852 Erlangen, W. Germany). *Fortschr. Med.* 95(27): 1711-1714; 1977.

2308 DIAGNOSIS OF PANCREATIC TUMORS USING TWO-INDICATOR SCANNOGRAPHY. (Rus.) Vinogradov, V. A.; Itin, A. B. (Oncological Science Center, Acad. Medical Science USSR, Moscow, USSR). *Med. Radiol. (Mosk.)* 22(8):25-30; 1977.

2309 CYSTADENOMA ON HETEROTOPIC PANCREATIC TISSUE: PRESENTING AS A CHRONIC ANEMIA. (Fre.) Kaswin, R.; Nouel, O.; Leclerc, J. P.; Sobotka, F.; Celerier, M.; Modigliani, R. (Hopital Fernand-Widal, 200, rue du Faubourg-Saint-Denis, F 75010 Paris, France). *Gastroenterol. Clin. Biol.* 1(5):461-466; 1977.

2310 FUNCTIONAL AND MORPHOLOGIC STUDIES OF THE EFFECT OF ALCOHOL ON THE PANCREATIC PARENCHYMA. (Eng.) Bordalo, O.; Noronha, M.; Dreiling, D. A. (Faculty Medicine of Lisbon, Lisbon, Portugal). *Mt. Sinai J. Med.* 44(4):481-484; 1977.

See also, 1865, 2001, 2002, 2003, 2015, 2016, 2017, 2019, 2020, 2021, 2023, 2039, 2047, 2232, 2318, 2356, 2441, 2462, 2496, 2591, 2592.

PANCREAS

Pancreatitis

2311 MECHANISM AND SPECIFICITY OF INCREASED AMYLASE/CREATININE CLEARANCE RATIO IN PANCREATITIS. (Eng.) Marten, A.; Beales, D.; Elias, E. (Royal Free Hosp., London, England). *Gut* 18(9):703-708; 1977.

The amylase/creatinine clearance ratio (Cam/Ccr ratio) was determined in 89 controls, 13 patients with acute pancreatitis, 18 patients with choledocholithiasis, 14 diabetics, 19 alcoholics with liver disease, 30 patients with chronic pancreatitis,

3 patients with peptic ulcer, 12 patients with primary biliary cirrhosis, 13 patients with pancreatic carcinoma, and 30 patients with chronic renal failure to test the specificity of the Cam/Ccr ratio and to observe the relationship of plasma glucagon to renal amylase clearance. In the 87 hospitalized control patients without pancreatic disease, the Cam/Ccr ratio was 3.02 ± 0.69. The ratio was above the normal range in all patients with acute pancreatitis but was normal in those with chronic pancreatitis and carcinoma of the pancreas. In 18 patients with cholelithiasis, an increased ratio distinguished those with pancreatitis, as assessed independently during laparotomy, from those with a macroscopically normal pancreas. Raised Cam/Ccr ratios were also found in diabetics with ketoacidosis and in three patients with fulminant alcoholic liver disease. Although a positive correlation was found between the Cam/Ccr ratio and serum creatinine concentration, abnormally high ratios did not occur in the 30 patients with chronic renal failure. A significant increase in Cam/Ccr ratios was produced in six healthy volunteers by the i.v. injection of glucagon. However, it is unlikely that hyperglucagonemia alone accounts for the increased Cam/Ccr ratio seen in acute pancreatitis, as no correlation was found between the clearance ratio and the plasma glucagon concentration in a series of patients. In two other patients in whom excess circulating pancreatic polypeptide was detected, the Cam/Ccr ratio was normal. It is concluded that, in view of the sensitivity and relative specificity of finding an increased Cam/Ccr ratio in acute pancreatitis, its determination should be valuable clinically, especially in those cases of hyperamylasemia where the cause is in doubt. It is unlikely that either glucagon or pancreatic polypeptide is a major factor in the production of the increased Cam/Ccr ratio.

2312 AMYLASE/CREATININE CLEARANCE RATIO (C_{Am}/C_{Cr}) AND RENAL TUBULAR FUNCTION IN ACUTE PANCREATITIS (AP): LACK OF SPECIFICITY [Abstract]. (Eng.) Lankisch, P. G.; Wolfrum, D. I.; Koop, H.; Winckler, K. (Dept. Medicine, Univ. Gottingen, Gottingen, W. Germany). *Ir. J. Med. Sci.* 146(Suppl. 1):28; 1977.

2313 CRITICAL ANALYSIS OF SURGICAL RESULTS IN CHRONIC PANCREATITIS (CP) [Abstract]. (Eng.) Ammann, R. (Univ. Hosp., CH-8091 Zurich, Switzerland). *Ir. J. Med. Sci.* 146(Suppl. 1):18; 1977.

2314 HYPERLIPAEMIA IN PANCREATITIS [Abstract]. (Eng.) Schmidt, A.; Buch, J.; Buch, A. (Kommunehospitalet, 1399 Copenhagen K, Denmark). *Ir. J. Med. Sci.* 146(Suppl. 1):2; 1977.

2315 CHRONIC PANCREATITIS IN ITALY: AETIOLOGICAL FACTORS [Abstract]. (Eng.) Gullo, L. (Dept. Medicine, Bologna, Italy). *Ir. J. Med. Sci.* 146(Suppl. 1):1-2; 1977.

2316 THE SERUM COMPLEMENT SYSTEM AS AN INITIATOR AND PROGNOSTIC CLUE IN ACUTE PANCREATITIS [Abstract]. (Eng.) Seelig, R.; Lankisch, P. G.; Koop, H.; Kaboth, U.; Winckler, K.; Seelig, H. P. (Inst. Immunology, Univ. Heidelberg, Heidelberg, W. Germany). *Ir. J. Med. Sci.* 146 (Suppl. 1):1; 1977.

2317 DRUGS AS ASSOCIATED FACTORS IN PRIMARY ACUTE PANCREATITIS [Abstract]. (Eng.) Bourke, J. B.; McIllmurray, M. B.; Mead, G. M.; Langman, M. J. S. (City Hosp., Nottingham, England). *Ir. J. Med. Sci.* 146(Suppl. 1):1; 1977.

2318 THE USE OF PAROTID SECRETION IN SCREENING FOR CHRONIC PANCREATITIS [Abstract]. (Eng.) Noronha, M.; Dreiling, D.; Bordalo, O. (Faculty Medicine, Univ. Lisbon, Lisbon, Portugal). *Ir. J. Med. Sci.* 146(Suppl. 1): 14; 1977.

2319 THE STUDY OF PAROTID AND MIXED SALIVA IN THE DIAGNOSIS OF CHRONIC PANCREATITIS [Abstract]. (Eng.) Dobrilla, G.; Valentini, M.; Filippini, M.; Bonoldi, M. C.; Felder, M.; Moroder, E. (Ospedale Regionale I, 39100, Bolzano, Italy). *Ir. J. Med. Sci.* 146(Suppl. 1):13; 1977.

2320 IMPAIRED RELEASE OF PANCREATIC POLYPEPTIDE IN PATIENTS WITH CHRONIC PANCREATITIS [Abstract]. (Eng.) Hacki, W. H.; Kayasseh, L.; Gyr, K. (Medical Faculty, Univ. Berne, Berne, Switzerland). *Ir. J. Med. Sci.* 146(Suppl. 1):12-13; 1977.

2321 AN EVALUATION OF THE LUNDH-BORGSTROM TEST AND THE SECRETIN-PANCREOZYMIN TEST IN THE DIAGNOSIS OF CHRONIC PANCREATITIS [Abstract]. (Eng.) Braganza, J. M.; Rao, J. J. (Royal Infirmary, Manchester, England). *Ir. J. Med. Sci.* 146(Suppl. 1):12; 1977.

2322 MALABSORPTION IN CHRONIC PANCREATITIS [Abstract]. (Eng.) Wakasugi, H. (Faculty Medicine, Kyushu Univ., Fukuoka, Japan). *Gastroenterol. Jpn.* 12(4):324; 1977.

2323 INCIDENCE AND MORTALITY OF ACUTE PANCREATITIS [Letter to Editor]. (Eng.) Bourke, J. B. (Dept. Surgery, Univ. Nottingham,

Nottingham, England). *Br. Med. J.* 2(6103):1668-1669; 1977.

2324 CHRONIC ALCOHOLIC PANCREATITIS; PATHOGENESIS AND CLINICAL FEATURES INCLUDING PROSPECTIVE STUDIES OF CHRONIC ALCOHOLICS [Abstract]. (Eng.) Homma, T. (Dept. Medicine, Shinshu Univ., Asahimachi, Matsumoto, Japan). *Gastroenterol. Jpn.* 12(4):341; 1977.

2325 PATHOGENESIS AND PROGNOSIS OF ALCOHOLIC CHRONIC PANCREATITIS [Abstract]. (Eng.) Saitoh, Y. (Tohoku Univ. Sch. Medicine, Sendai, Japan). *Gastroenterol. Jpn.* 12(4):341-342; 1977.

See also, 2001, 2002, 2015, 2018, 2039, 2119, 2304, 2492, 2514, 2541, 2607.

LIVER AND BILIARY TRACT

2326 MICROCALORIMETRIC MEASUREMENTS OF HEAT PRODUCTION IN ERYTHROCYTES OF PATIENTS WITH LIVER DISEASES. (Eng.) Monti, M. (Univ. Hosp., S-221 85 Lund, Sweden). *Scand. J. Haematol.* 19(3):313-318; 1977.

RBC metabolic activity was investigated in 12 patients with severe liver disease. Measurements of RBC heat production and glucose consumption were made *in vitro* with and without stimulation of the pentose phosphate pathway with methylene blue. The RBC resting heat effect value was 25% higher than normal ($p<0.005$). A normal value was obtained when heat effect was measured under maximal stimulation with 10^{-4} M methylene blue. Glucose consumption was normal, both in unstimulated and methylene blue-stimulated RBC. The results do not support the hypothesis that hemolytic anemia in patients with liver disease is related to decreased activity of the pentose phosphate pathway.

2327 DIFFUSE INTRAVASCULAR COAGULATION IN LIVER DISEASE? (Eng.) Straub, P. W. (Inselspital, Berne, Switzerland). *Semin. Thromb. Hemostas.* 4(1):29-39; 1977.

Arguments for the role of diffuse intravascular coagulation (DIC) in liver diseases are critically reviewed. The following signs of DIC are discussed: the presence of microthrombi, hypofibrinogenemia and decreases in factors V and VIII, thrombocytopenia, the accelerated disappearance of plasma fibrinogen, increases in circulating FDP, the presence of fibrinogen-fibrin complexes, and the reversal of laboratory abnormalities after heparin therapy. In general, although some degree of activation of coagulation is probably present in a condition associated with tissue necrosis, the role that it plays in the hemostatic failure of patients with liver diseases appears to be far from established. In the presence of decreased fibrinogen synthesis, even discrete DIC could result in impressive finding, apt to be misinterpreted in their significance. Findings compatible with a diagnosis of DIC, and subject to the same criticism, have also reported various severe acute liver diseases other than cirrhosis. Therapy is discussed with reference to the current knowledge concerning the pathophysiology of the coagulation defect in liver diseases.

2328 COAGULATION ABNORMALITIES IN LIVER DISEASE. (Eng.) Lechner, K.; Niessner, H.; Thaler, E. (First Dept. Medicine, Univ. Vienna, Vienna, Austria). *Semin. Thromb. Hemostas.* 4(1): 40-56; 1977.

Recent data relating to coagulation abnormalities in liver disease are summarized; pathogenetic factors responsible for these abnormalities are discussed; and the role of functional and immunologic clotting tests for the evaluation of liver function and the differential diagnosis and prognosis of liver disease is defined. In the majority of patients with liver disease, the blood levels of the vitamin K-dependent clotting factors (factors II, VII, IX, and X) are reduced primarily because of the decreased capacity of the liver to synthesize proteins. The activity of antithrombin III is also decreased in patients with acute and chronic liver disease, and a prolonged thrombin time is often observed. The degree of reduction of clotting factors II, V, VII, and X, and of antithrombin III correlates fairly well with the extent of liver damage and can be used as a guide to prognosis, provided that other mechanisms that may influence the blood levels are carefully considered. Clotting factor assays have only a limited value for the differential diagnosis of liver disease, however. Specific blood coagulation changes in the following liver diseases are discussed: acute liver disease, liver cirrhosis, chronic hepatitis, biliary cirrhosis and obstructive jaundice, Dubin-Johnson syndrome, Gilbert syndrome, primary hepatocellular carcinoma, and metastatic cancer of the liver.

2329 THE LIVER IN SARCOIDOSIS. (Eng.) Lehmuskallio, E.; Hannuksela, M.; Halme, H. (Univ. Central Hosp., Helsinki, Finland). *Acta Med. Scand.* 202(4):289-293; 1977.

The results of liver function tests were studied in 325 Finnish patients with sarcoidosis and in 132 patients with nonsarcoid erythema nodosum, and needle biopsy specimens of the liver were examined in 121 sarcoidosis patients. Granulomas compatible with sarcoidosis were seen in 24% of the 121 biopsied cases. Liver function tests (serum alkaline phosphatase, serum alanine aminotransferase, serum aspartate aminotransferase, and BSP clearance test) were abnormal, especially in patients with extensive erythema nodosum, but there was no correlation with the disease responsible for the eruption. Serum alanine aminotransferase was markedly increased in 3 of 61 cases examined; all of these patients had erythema nodosum. Among 310 cases examined, 1.3% had high alkaline phosphatase levels, all of whom had sarcoidosis. BSP excretion was abnormal in 8% of the patients examined. Hepatic granulomas were found more often in patients with sarcoid changes in the lung parenchyma than in those with bilateral hilar adenitis only (14/46 cases versus 10/64 cases). There were no other definite correlations between hepatic granulomas and other clinical and laboratory findings. The incidence of pathological results in this study was clearly lower than that in the United States, thus reflecting a good prognosis of sarcoidosis in the Scandinavian countries.

2330 CHRONIC LIVER DYSFUNCTION IN MULTITRANSFUSED HEMOPHILIACS. (Eng.) Hasiba, U. W.; Spero, J. A.; Lewis, J. H. (Central Blood Bank Pittsburgh, 812 Fifth Ave., Pittsburgh, PA 15219). *Transfusion* 17(5):490-494; 1977.

The potential adverse effects of long-term exposure to multiple lots of pooled fractions was evaluated by determining SGPT and SGOT levels and serum hepatitis B surface antigen (HBsAg) and antibody to HBsAg (anti-HBs) during a 3-yr period in 118 patients with factor VIII or factor IX deficiency. The 107 HBsAg-negative patients were divided into four groups according to their mode of therapy. Persistently abnormal transaminase values were present in 51% of patients with a large exposure to factor VIII concentrates, in 43% with a small factor VIII exposure, and in 37% exposed to prothrombin complexes. This was contrasted with abnormalities in 8% of patients treated only with cryoprecipitate. The incidence and degree of serum transaminase abnormality appeared to be independent of a past history of jaundice. All patients without persistent antigenemia who had been treated with pooled plasma products showed antibodies to HBsAg. High titer anti-HBs prior to initial fraction therapy appeared to be protective against jaundice. The 11 patients with persistent antigenemia had significantly higher transaminase levels than the HBsAg-negative group.

2331 LIVER DYSFUNCTION IN PATIENTS WITH HEMOPHILIA A, B, AND VON WILLEBRAND'S DISEASE. (Eng.) Hilgartner, M. W.; Giardina, P. (Cornell Univ. Medical Coll.-New York Hosp., 525 E. 68th St., New York, NY 10021). *Transfusion* 17(5):495-499; 1977.

The incidence of liver disease was determined in 95 patients with hemophilia A or B, or von Willebrand's disease, who were followed over a 3-yr period. Half the patients were treated episodically, and half received additional prophylactic treatment. Fifty-five per cent had significantly elevated SGOT and SGPT levels, and had biochemical evidence of chronic active liver disease. Two percent had subacute and active cirrhosis. There was an annual attack rate of hepatitis B of 3.5%, and hepatitis B antibody titers were present in 84%. Asymptomatic liver disease in patients with hemophilia requires close monitoring to determine the clinical significance.

2332 CONTRACEPTIVE STEROIDS AND LIVER LESIONS. (Eng.) Garcia, C. R.; Gordon, J.; Drill, V. A. (Univ. Pennsylvania Hosp., Philadelphia, PA 19104). *J. Toxicol. Environ. Health* 3(1/2):197-206; 1977.

Factors concerning the possible untoward effect of oral contraceptives on the liver are reviewed. During the past 10 yr, an increasing number of cases of hepatic adenomas and related lesions has been reported in women using these contraceptives. Such lesions occur only rarely, but it is the rarity itself that makes it difficult to evaluate the role of the contraceptive steroids. The enormity of the denominator in contraceptive steroid usage is so unwieldy that mechanisms to measure accurately the difference in an extremely small numerator are still plaguing the epidemiologist, who at best can supply only estimates. Oral contraceptives do not significantly alter liver function tests in experimental animals, although women receiving the steroids may show a small degree of BSP retention similar to that occurring during pregnancy. Benign cholestatic jaundice may occur in patients taking the pill, although it is now recognized that this jaundice is similar to the benign cholestatic jaundice of pregnancy and that it occurs primarily in women with a history of the latter.

2333 SYSTEMIC AND REGIONAL TREATMENT OF PRIMARY CARCINOMA OF THE LIVER. (Eng.) Lee, Y. T. N. (Univ. Southern California Medical Center, Los Angeles, CA 90033). *Cancer Treat. Rev.* 4(3):195-212; 1977.

Therapy for primary hepatic carcinoma is reviewed, with particular emphasis on the results of each type of therapy. The median survival after diagnosis for symptomatically treated patients is less

than 4 months. Surgical resection is the treatment of choice. The reported resectability rate was 0-30%, and the operative mortality rate 12.5-34%. Although the majority of cases die with recurrent disease, patients whose lesion can be resected have the highest 5-yr survival rate (10-15%). Radiotherapy has been shown to be of limited benefit for primary carcinoma of the liver. Although chemotherapy in the past produced a low response rate and did not prolong survival times, in a recent study, 7 of 19 patients had objective response to combinations of 5-fluorouracil (5-FU) and bischloroethyl-nitrosourea (BCNU), and 3 patients were in complete remission for 3, 4 and 6 yr, resp. In another study, all 11 patients responded to adriamycin (median survival=8 months), with 3 exhibiting complete tumor regression and surviving 8, 9, and 13 months, resp. Several reports showed that the intra-arterial infusion of chemotherapeutic agents (5-FU, fluorodeoxyuridine, methotrexate, and mitomycin) can cause response in 50-75% of the cases, and prolong survival over untreated patients or patients receiving other routes of chemotherapy. Deliberate ligation of the hepatic artery has been used as treatment of primary tumors of the liver. Excluding patients with cirrhosis, massive involvement of the liver, and far-advanced hepatic decompensation, the overall operative mortality associated with hepatic artery ligation is about 19%, with 4% directly attributable to ligation of the artery. Several investigators have administered chemotherapeutic agents either to branches of the portal vein or to the distal hepatic artery to prevent tumor regrowth. However, there is no definite evidence that hepatic artery ligation, with or without added infusion chemotherapy to the liver, gives better response and/or survival results than infusion chemotherapy to the hepatic artery alone. Other therapeutic approaches such as infusion chemotherapy via the portal vein, ligation of portal vein branches, and liver transplantation have not shown definite benefit. On the other hand, two cases of spontaneous regression of hepatoma and three cases of documented cure after 5-FU or 5-FU-BCNU combination chemotherapy have been reported. For nonresectable lesions of hepatic carcinoma, regional and systemic chemotherapeutic treatment is available. With the availability of adriamycin and newer combinations of effective agents, the outlook for such patients may be greatly improved.

2334 GRANULOMATOUS LIVER DISEASE AND GIANT CELL ARTERITIS. CASE REPORT AND LITERATURE REVIEW. (Eng.) Litwack, K. D.; Bohan, A.; Silverman, L. (Hoag Memorial Hosp., Newport Beach, CA 92663). *J. Rheumatol.* 4(3):307-312; 1977.

The case of a 64-yr-old woman with granulomatous liver disease associated with the polymyalgia rheumatica-giant cell arteritis syndrome is presented. Treatment with prednisone (45 mg/day) resulted in prompt improvement in both the polymyalgia rheumatica-giant cell arteritis syndrome, as well as the tests of liver function. Polymyalgia rheumatica and giant cell arteritis may involve the liver and should be included in the differential diagnosis of granulomatous liver disease.

2335 SERUM, CEREBROSPINAL FLUID, AND BRAIN LEVELS OF BILE ACIDS IN PATIENTS WITH FULMINANT HEPATIC FAILURE. (Eng.) Bron, B.; Waldram, R.; Silk, D. B. A.; Williams, R. (King's Coll. Hosp. and Medical Sch., Denmark Hill, London, England). *Gut* 18(9):692-696; 1977.

To investigate whether the known toxic effects of bile salts are involved in the pathogenesis of cerebral edema in fulminant hepatic failure (FHF), bile acid levels were measured in the sera, cerebrospinal fluid (CSF), and brain tissue of 10 patients immediately after death from FHF. Serum bile acids in FHF were predominantly conjugated, and total bile acid levels were higher in all 10 patients than in normal controls (85.9 ± 8.4 compared with 5.7 ± 0.4 nmol/ml, $p<0.001$). Small but significant amounts of bile acids were detected in CSF (range 1.2-5.3 nmol total bile acid/ml) and brain biopsies (1.0-18.8 nmol/g wet weight) of FHF patients, whereas none could be detected in CSF and brain biopsies of patients dying without evidence of liver disease. There was no relationship between serum, CSF, or brain levels of bile acids and duration of coma, or presence of cerebral edema found in five FHF patients at necropsy. However, serum bile acid levels were similar in FHF to those found in chronic liver disease without encephalopathy and lower than those found to inhibit brain respiration *in vitro*. A primary role for these compounds in the pathogenesis of coma in FHF therefore seems unlikely.

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See also, 1879, 2004, 2005, 2006, 2007, 2008, 2027, 2029, 2162, 2212, 2219, 2220, 2232, 2372, 2391, 2419, 2432, 2465, 2526, 2530, 2538, 2541, 2548, 2588, 2589, 2590, 2608, 2615, 2616, 2620.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

2363 UNCONJUGATED HYPERBILIRUBINEMIA AND CHRONIC PERSISTENT HEPATITIS [Abstract]. (Eng.) Felsher, B.; Carpio, N. (Veterans Admin. Hosp., Long Beach, CA). *Clin. Res.* 26(2):150A; 1978.

2364 SISTER CHROMATID EXCHANGE IN BABIES TREATED BY PHOTOTHERAPY [Letter to Editor]. (Eng.) Goyanes-Villaescusa, V. J.; Ugarte, M.; Vazquez, A. (Juan Canalejo Hosp., La Coruna, Spain). *Lancet* 2(8047):1084-1085; 1977.

See also, 2539.

LIVER AND BILIARY TRACT

Nonviral Hepatitis and Hepatic Injury

2365 GRANULOMATOUS HEPATITIS. (Pol.) Kozakiewicz, H.; Stolarczyk, J.; Ellert-Zygadlowska, J.; Zielinska, W.; Jasiel, M. (Klinika Chorob Zakaznych Instytutu Chorob Wewnetrznych AM, ul. Smoluchowskiego 18, 80-214 Gdansk-Wrzeszcz, Poland). *Pol. Tyg. Lek.* 32(17):647-649; 1977.

Granulomatous hepatitis (GH) is a disease with chronic and hidden course, with various intensities of clinical symptoms and morphological changes, mainly in the form of granulomas situated in liver lobules and portal spaces. Most frequently, GH is caused by such chronic infections as tuberculosis, brucellosis, tularemia, Q fever, syphilis, deep mycosis, and also by sarcoidosis and Hodgkin's disease. Intensity of nodular infiltrations in tuberculosis depends on the kind, localization, and intensity of the disease. Similar granulomatous changes are observed in active brucellosis, especially caused by *Brucella abortus bovis*. Nodular infiltrations of the liver with a tendency to necrosis and caseation appear during the acute period of tularemia. Hepatosplenomegaly and hepatic malfunction in Q fever are also accompanied by granulomatous infiltrations. Similar changes occur in mononucleosis and mycosis, and especially in

actinomycosis, when macroscopic nodules and abscesses may occur in the liver. GH is very often caused by sarcoidosis in which granulomatous infiltrations in liver are found in 60% of the cases. Polymorphic infiltrations occur in 70% of the cases in Hodgkin's disease. GH can be also caused by several chemical and pharmacological agents. It was observed in berylliosis, silicoidosis, poisoning by copper-containing pesticides, drug hypersensitivity, and in some autoimmune diseases. It is not known whether liver granulomas are caused by action of exogenous agents or autoimmunization. Even though clinical symptoms of GH are different and nonspecific, detailed studies based on biopsies should clarify the mechanism of reaction of liver tissue to the pathogenic agents.

2366 CHANGES OF THE MITOTIC ACTIVITY OF HEPATOCYTES AND RESORPTION OF NECROTIC AREAS IN THE FORMATION OF LIVER CIRRHOSIS. (Rus.) Petrovichev, N. N. (I. P. Pavlov First Leningrad Medical Inst., Leningrad, USSR). *Biull. Eksp. Biol. Med.* 81(5):617-618; 1976.

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2369 PRONESTYL INDUCED GRANULOMATOUS HEPATITIS [Abstract]. (Eng.) Espiritu, C. R.; Alalu, J. V.; Lubin, J. (Mount Sinai Medical Center, Miami Beach, FL). *Gastroenterology* 73(5): 1219; 1977.

2370 DRUG-INDUCED FULMINANT HEPATITIS [Abstract]. (Eng.) Yamaguchi, K.; Namihisa, T. (Juntendo Univ. Sch. Medicine, Tokyo, Japan). *Gastroenterol. Jpn.* 12(4):328-329; 1977.

2371 FOLLOW-UP OF HALOTHANE HEPATITIS: BENIGN RESOLUTION OF A SEVERE LESION [Abstract]. (Eng.) Miller, D. J.; Klatskin, G. (Dept. Medicine, Yale Univ., New Haven, CT). *Gastroenterology* 73(5):1234; 1977.

See also, 1913, 1918, 2327, 2344.

LIVER AND BILIARY TRACT

Acute Viral Hepatitis

2372 HBsAg, CHRONIC LYMPHOPROLIFERATIVE DISORDERS, AND CIRRHOSIS OF LIVER. (Eng.) Heimann, R.; Ray, M. B.; Desmet, V. J. (Dept. Pathology, Institut Jules Bordet, Univ. Brussels, B. 1000 Brussels, Belgium). *J. Clin. Pathol.* 30(9): 817-821; 1977.

The incidence of hepatitis B surface antigen (HBsAg) was studied in 23 necropsy cases of chronic lymphoproliferative disorders to clarify the previously reported high incidence of cirrhosis in such disorders. The type of lymphoma was reviewed in the light of the new functional classifications of non-Hodgkin malignant lymphomas introduced by Lennert and Lukes. The presence of HBsAg in the liver was investigated by the indirect immunofluorescence technique. Eleven cases showed plasmocytoid features and were considered to be immunocytomas. Seven cases showed liver cirrhosis; six of them belonged to the immunocytoma group. Four cases were HBsAg-positive. Three of them were found among the group combining cirrhosis and immunocytoma. They presented the abundant nodular distribution of HBsAg typical of inactive cirrhosis. A parallel is drawn between the often reported association of Waldenstrom's syndrome and cirrhosis and the association of immunocytoma and cirrhosis observed in this study. The analogy is further justified since most of the lymphomas associated with Waldenstrom's syndrome happen to be immunocytomas. Therefore the association between hepatitis B virus infection and cirrhosis on the one hand and chronic lymphoproliferative disorders on the other may not be purely coincidental. A chronic antigenic stimulus such as persisting HBsAg could trigger the proliferation of a malignant lymphoid clone.

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2374 INFLUENCE OF VARIOUS THERAPEUTIC METHODS ON THE FUNCTIONAL STATUS OF THE KIDNEYS IN CHILDREN WITH VIRAL HEPATITIS. (Ukr.) Kadirov, B. A. (Second Dept. Childhood Infections, Central Asiatic Inst. Pediatric Medicine, USSR). *Pediatr. Akush. Ginekol.* (6):17; 1976.

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2378 HYDROPHILIA OF TISSUES AND EXTRACELLULAR LIQUID IN PATIENTS TREATED WITH PREDNISOLONE FOR VIRAL HEPATITIS. (Ukr.) Lebed', O. P. (Dept. Propedeutics and Pediatrics, Vinnitsa Medical Inst., Vinnitsa, USSR). *Pediatr. Akush. Ginekol.* (6):18-19; 1976.

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2390 CLINICAL SIGNIFICANCE OF ANTIGENEMIA DETERMINED DURING VIRAL HEPATITIS IN CHILDREN. (Rus.) Petrunin, Iu. P.; Bokovoy, A. G. (Dept. Childhood Infectious Diseases, N. I. Pirogov Second Moscow Medical Inst., Moscow, USSR). *Vopr. Okhr. Materin. Det.* 21(10):25-28; 1976.

2391 TREATMENT OF HEPATIC COMA IN CHILDREN WITH VIRAL HEPATITIS. (Ukr.) Starodub, N. S.; Vereshchagin, I. A.; Nikitiuk, L. S. (Donetsk Medical Inst., Donetsk, USSR). *Pediatr. Akush. Ginekol.* (6):20-21; 1976.

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2393 COMPARATIVE STUDY OF THREE PASSIVE INVERSE HEMAGGLUTINATION TECHNIQUES FOR THE DETECTION OF HBs ANTIGEN. [Letter to Editor]. (Fre.) Chevallier, P.; Trepo, D.; Trepo, C.; Sepetjian, M. (Laboratoire d'Hygiene, Domaine Rockefeller, 8, av. Rockefeller, F 69373 Lyon Cedex 2, France). *Nouv. Presse Med.* 6(22):1975; 1977.

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2395 SIGNIFICANCE OF THE PHYSICAL FITNESS OF PATIENTS WITH SUBSIDING VIRAL HEPATITIS: RELEVANCE OF THE BROMSULPHALEIN TEST. (Ger.) Weigl, E.; Bach, H.; Sieber, H. (Krankenhauses Eisenhuttenstadt, Friedrich-Engels-Str. 39, DDR-122 Eisenhuttenstadt, E. Germany). *Dtsch. Gesundheitsw.* 32(22):1023-1027; 1977.

2396 INFLUENCE OF PHYSICAL ACTIVITY ON CERTAIN BIOHUMORAL PARAMETERS IN THE COURSE OF ACUTE VIRAL HEPATITIS (A-B). (Ita.) Morettini, A.; Bartoletti, L.; Chibbaro, G.; De Cecco, A.; Gabrielli, M.; Ghetti, A.; *et al.* (Archispedale de Santa Maria Nuova e Stabilimenti Riuniti, Florence, Italy). *Recent. Prog. Med. (Roma)* 62(3): 295-310; 1977.

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2399 VIRAL HEPATITIS. (Fre.) Lemaire, A. (37, avenue de Breteuil, 75007 Paris, France). *Ann. Gastroenterol. Hepatol.* 13(3):273-281; 1977.

2400 RECENT DATA ON ACUTE VIRAL HEPATITIS. (Ger.) Sauerbruch, T. (Stadtisches Krankenhaus Munchen-Schwabing, 5. Medizinische Abteilung, Kolner Platz 1, D-8000 Munich 40, W. Germany). *Med. Klin.* 71(43):1809-1825; 1976.

2401 CURRENT EPIDEMIOLOGICAL ASPECTS OF INFECTIOUS AND SERUM HEPATITIS. (Rus.) Tareev, E. M.; Shatrov, I. I.; Mastiukova, Iu. N. (No affiliation given). *Sov. Med.* (2):40-46; 1977.

2402 IMMUNOMORPHOLOGICAL STUDY OF THE ACTIVITY OF A PROCESS INDUCED BY VIRAL AGENTS IN CHRONIC LIVER DISEASES. (Rus.) Barinsky, I. F.; Semendyaeva, M. E.; Lorie, N. Yu.; Bezprozvanny, B. K. (D. I. Ivanovskii Inst. Virology, USSR Acad. Medical Sciences, USSR). *Sov. Med.* (12):47-50; 1976.

2403 A HEMOPOIETIC SYSTEM DISORDER IN VIRAL HEPATITIS. (Rus.) Golzand, I. V.; Blagoslovensky, G. S.; Popova, L. A.; Petrova, E. M.; Golovanova, L. V. (Clinic Viral Hepatitis, Leningrad Scientific Res. Inst. Childhood Infections, Leningrad, USSR). *Klin. Med. (Mosk.)* 54(8):33-37; 1976.

2404 ASYMPTOMATIC CARRIERS OF HEPATITIS B-ASSOCIATED ANTIGEN (HBsAg) AMONG VOLUNTARY BLOOD DONORS IN QUEBEC. (Fre.) Valet, J. P.; Rousseau, C.; Ackermann, H. W. (Centre Hospitalier de l'Universite, 2705, boul. Laurier, Quebec, Quebec G1V 4G2, Canada). *Union Med. Can.* 106(7):966-970; 1977.

2405 NONSPECIFIC IMMUNITY IN CHILDREN WITH VIRAL HEPATITIS. (Rus.) Safonova, E. S.; Mikhailova, Z. M. (Moscow Oblast M. F. Vladimirskii Scientific Res. Clinical Inst., Moscow, USSR). *Pediatriia* (3):27-29; 1977

2406 DYNAMICS OF T- AND B-LYMPHOCYTES IN PATIENTS WITH VIRAL HEPATITIS. (Rus.) Belozerov, E. S.; Arkhipov, G. S.; Sagandykov, B. B.; Shabalin, V. V. (Dept. Infectious Diseases, Semipalatinsk Medical Inst., Semipalatinsk, USSR). *Klin. Med. (Mosk.)* 54(11):24-26; 1976.

2407 INTRACELLULAR METABOLIC ACTIVATION IN NEUTROPHILS OF CHILDREN WHO ARE LONG-TERM HBsAg CARRIERS. (Ita.) Vierucci, A.; De Martino, M.; Moggi, C.; Zuccati, G.; Calabri, G. (Istituto di Clinica Pediatrica dell'Universita di Firenze, Florence, Italy). *Minerva Pediatr.* 29(13):935-937; 1977.

2408 HEPATOLOGICAL ASPECTS OF HBsAg-POSITIVE BLOOD DONORS. (Ger.) Schimmelpfennig, W.; Wack, V.; Wack, R.; Schneider, G.; Lunzenauer, K.; Wicht, U.; Schaffner, U. (II. Medizinischen Klinik des Bereichs Medizin [Charite] der Humboldt-

Universitat, Schumannstr. 20/21, DDR-104 Berlin, E. Germany). *Dtsch. Gesundheitsw.* 32(22):1033-1036; 1977.

2409 EVOLUTION OF CHOLESTATIC VIRAL HEPATITIS. (Fre.) Vachon, A.; Paliard, P.; Tete, R.; Jean-Louis, Ph.; Gagnolet, R. (No affiliation given). *J. Med. Lyon* 57(1303):327-334; 1976.

2410 SERUM BILE SALTS IN LIVER DISEASES [Abstract]. (Fre.) Annoni, G.; Barbi, G. L.; Donati, C.; Ideo, G.; Dioguardi, N. (Istituto di Clinica Medica III, Universita degli Studi di Milano, Milan, Italy). *Gastroenterol. Clin. Biol.* 1(5):487; 1977.

2411 SEVERE HEMORRHAGE OF THE DIGESTIVE TRACT IN THE COURSE OF ACUTE VIRAL HEPATITIS. (Ita.) Mazzacuva, D.; Tarozzi, C. A. (Ospedale Civile di Imola, Imola, Italy). *Minerva Pediatr.* 29(9):637-639; 1977.

See also, 1903, 2010, 2327, 2330, 2331, 2344, 2414, 2416, 2417, 2418, 2423, 2429, 2541.

LIVER AND BILIARY TRACT

Chronic Hepatitis

2412 CHRONIC ACTIVE HEPATITIS AND PULMONARY HYPERTENSION. (Eng.) Cryer, P. E.; Kissane, J. M.; Pierce, J.; Biello, D.; Kuhn, C., III; Lander, J.; *et al.* (Washington Univ. Sch. Medicine, St. Louis, MO). *Am. J. Med.* 63(4):604-613; 1977.

A 46-yr-old woman suffered cardiopulmonary arrest and died shortly after a second hospitalization for shortness of breath. She had been hospitalized 4 yr earlier for what was diagnosed as viral hepatitis, but had an apparently uneventful recovery. She had been taking a phenothiazine preparation, which she continued to take throughout the next year. Chronic active hepatitis, cirrhosis, and slight cardiomegaly were noted when she was rehospitalized 2.5 yr later for extreme shortness of breath. A cushingoid appearance developed after treatment with prednisone (20 mg/day), and the dosage was decreased to 5 mg/day. The diagnosis of chronic active hepatitis and cirrhosis was reconfirmed when the patient was rehospitalized 1 yr later. Pulmonary hypertension was also confirmed, and she appeared not to have a cardiomyopathy. The final anatomic diagnosis was chronic active hepatitis with cirrhosis of the liver, mild glomerulonephritis, chronic pancreatitis, primary pulmonary hypertension, and a small pulmonary thromboembolus.

2413 FIBROBLAST INTERFERON IN HBsAg-POSITIVE CHRONIC ACTIVE HEPATITIS [Letter to Editor]. (Eng.) Weimar, W.; Heijtink, R. A.; Schalm, S. W.; Van Blankenstein, M.; Masurel, N.; Edy, V. G.; *et al.* (Dept. Gastroenterology, Erasmus Univ. Rotterdam, Rotterdam, Netherlands). *Lancet* 2(8051):1282; 1977.

2414 SERUM IMMUNOREACTIVE PROLYL HYDROXYLASE IN LIVER DISEASE [Abstract]. (Eng.) Tuderman, L.; Risteli, J.; Miettinen, T. A.; Kivirikko, K. I. (Dept. Medical Biochemistry, Univ. Oulu, Oulu, Finland). *Scand. J. Gastroenterology* 12 (Suppl. 45):107; 1977.

2415 BILIARY BILE ACIDS IN CHRONIC ACTIVE HEPATITIS AND PRIMARY BILIARY CIRRHOSIS. THE SIGNIFICANCE OF ORCEIN POSITIVITY [Abstract]. (Eng.) Kesaniemi, Y. A.; Miettinen, T. A.; Salaspuro, M. P.; Sipponen, P. (Second Dept. Medicine, Univ. Helsinki, Helsinki, Finland). *Scand. J. Gastroenterol.* 12(Suppl. 45):45; 1977.

2416 THE IMPORTANCE OF CIRCULATING HEPATITIS B CORE ANTIGEN (HBcAg) IN CHRONIC HEPATITIS (CH) AND ITS RELATIONSHIP TO OTHER MARKERS OF HEPATITIS B VIRUS (HBV) INFECTION [Abstract]. (Eng.) Sagnelli, E.; Vermace, S. J.; Paronetto, F. (Mount Sinai Sch. Medicine, New York, NY). *Gastroenterology* 73(5):1245; 1977.

2417 LONG-TERM FOLLOW-UP AFTER HBsAg-NEGATIVE HEPATITIS [Abstract]. (Eng.) Rakela, J.; Redeker, A. G. (Univ. Southern California Sch. Medicine, Los Angeles, CA). *Gastroenterology* 73(5):1241; 1977.

2418 HEPATITIS A VIRUS INFECTION IN CHRONIC ACTIVE HEPATITIS [Abstract]. (Eng.) Rakela, J.; Redeker, A. G.; Mosley, J. W. (Univ. Southern California Sch. Medicine, Los Angeles, CA). *Gastroenterology* 73(5):1241; 1977.

See also, 2331, 2344, 2363, 2402, 2410, 2423, 2433, 2462, 2463, 2464, 2465, 2524.

Alcoholic Liver Disease

2419 THE ROLE OF ZINC DEFICIENCY IN HEPATIC ENCEPHALOPATHY [Abstract]. (Eng.) McClain, C. J. (Minneapolis Veterans Hosp., Minneapolis, MN). *Gastroenterology* 73(5):1233; 1977.

2420 GLYCEROL CLEARANCE AS A TEST OF GLUCONEOGENESIS IN ALCOHOLIC LIVER DISEASE [Abstract]. (Eng.) Johnston, D. G.; Wright, R.; Alberti, K. G. M. M. (Southampton General Hosp., Southampton, England). *Digestion* 16(4):330; 1977.

2421 MONOOXYGENASE ACTIVITY IN LIVER BIOPSY SPECIMENS OF PATIENTS WITH ALCOHOLIC LIVER DISEASE [Abstract]. (Eng.) Hoensch, H.; Hartmann, F.; Schomerus, H.; Reifferscheid, P. (Dept. Medicine, Univ. Tubingen, Tubingen, W. Germany). *Digestion* 16(4):352; 1977.

2422 PLASMA ALPHA AMINO-n-BUTYRIC ACID TO LEUCINE (A/L) RATIO: NONSPECIFICITY AS A MARKER FOR ALCOHOLISM [Abstract]. (Eng.) Dienstag, J. L.; Carter, E. A.; Wands, J. R.; Isselbacher, K. J.; Fischer, J. E. (Massachusetts General Hosp., Boston, MA). *Gastroenterology* 73(5): 1217; 1977.

2423 CARCINO-EMBRYONIC ANTIGEN IN NORMAL AND DISEASED LIVER TISSUE [Abstract]. (Eng.) Thung, S. N.; Gerber, M. A. (Mount Sinai Sch. Medicine, New York, NY 10029). *Fed. Proc.* 37(3): 303; 1978.

2424 DOUBLE BLIND CONTROLLED TRIAL OF CORTICOSTEROID THERAPY IN SEVERE ALCOHOLIC HEPATITIS WITH ENCEPHALOPATHY [Abstract]. (Eng.) Depew, W. T.; Boyer, T. D.; Omata, M.; Redeker, A. G.; Reynolds, T. B. (Univ. Southern California Sch. Medicine, Los Angeles, CA). *Clin. Res.* 26(2): 150A; 1978

2425 THE EFFECT OF CHRONIC ETHANOL ABUSE ON DELAYED HYPERSENSITIVITY EVALUATED BY MEANS OF A SKIN TEST. (Pol.) Caban, M.; Szczepaniec, M.; Mika, M. (Klinika Gastroenterologiczna Instytutu Medycyny Wewnetrznej AM, ul. Kopernika 15, 31-501 Krakow, Poland). *Pol. Tyg. Lek.* 32(8): 311-312; 1977.

2426 CLINICAL MANIFESTATIONS OF ALCOHOLIC LIVER CIRRHOSIS. (Rus.) Mukhin, A. S.; Lebedev, S. P.; Lopatkina, T. N. (I. M. Sechenov First Moscow Medical Inst., Moscow, USSR). *Ter. Arkh.* 49(2):69-74; 1977.

2427 TREATMENT OF HEPATIC STEATOSIS WITH PHOSPHORYLCHOLINE, HOMOCYSTEINE-GAMMA-THIOLACTONE AND VITAMIN B_{12}. CONTROLLED CLINICAL TRIAL. (Ita.) De Candia, O.; Mancinella, A.; Bartolucci, E.; Largajolli, F. (Ospedale Civile "Carreta," 31044 Montebelluna, Italy). *Clin. Ter.* 77(3): 251-262; 1976.

2428 EXCESSIVE GENERALIZED FAT EMBOLISM IN ACUTELY DYSTROPHIC FATTY LIVER. (Ger.) Schulz, F.; Hildebrand, E. (Gesundheitsbehorde der Freien und Hansestadt Hamburg, Hamburg, W. Germany). *Med. Klin.* 72(2):59-63; 1977.

2429 DIFFERENTIAL DIAGNOSIS OF ALCOHOLIC AND VIRAL LIVER DISEASES. (Rus.) Mukhin, A. S.; Semendyaeva, M. E.; Blinkov, I. L.; Vinogradova, L. G. (I. M. Sechenov First Moscow Medical Inst., Moscow, USSR). *Sov. Med.* (5):7-13; 1977.

See also, 1894, 1991, 2414, 2524.

Cirrhosis

2430 LIVER IMAGING DURING RETICULOENDOTHELIAL FAILURE. (Eng.) Antar, M. A.; Sziklas, J. J.; Spencer, R. P. (Veterans Admin Hosp., Newington, CT). *Clin. Nucl. Med.* 2(9):293-295; 1977.

The cases of two men with hepatic cirrhosis in whom the liver could not be visualized by means of i.v. administered ^{99m}Tc-sulfur colloid are described. There was thus hepatic "reticuloendothelial failure." In one case, the liver could be imaged following the i.v. administration of ^{67}Ga-citrate. In the second case, the liver retained some ability to accumulate ^{131}I-rose bengal. These cases emphasize the fact that one class of radiopharmaceuticals may be accumulated while another is not.

2431 PRESYMPTOMATIC PRIMARY BILIARY CIRRHOSIS. (Eng.) Hanik, L.; Eriksson, S. (Malmo

General Hosp., Malmo, Sweden). *Acta Med. Scand.* 202(4):277-281; 1977.

Clinical, laboratory, and follow-up results in 13 patients with asymptomatic primary biliary cirrhosis (PBC) collected during the last 10 yr in one hospital that serves a population of 250,000 inhabitants are presented. The mean observation time was 5.5 yr. Seventy-seven percent of these patients were asymptomatic at the time of diagnosis. Characteristic laboratory features in these asymptomatic patients were high alkaline phosphatase and glutamyl transpeptidase levels and very high levels of polyclonal IgM. The ESR was often increased. Signs of active cell destruction were slight, and functioning cell mass was well preserved. High titers of mitochondrial antibodies were consistently present. Needle biopsy was seldom sufficient for diagnosis but permitted staging of the disease. There was no correlation between clinical features and histological evolution stage. Compared with a preceding 10-yr period, the incidence of PBC has risen threefold. This increase can be fully explained by the extended use of laboratory facilities, resulting in the detection of PBC in asymptomatic patients.

2432 AN IMPROVED METHOD FOR MEASURING BLOOD MERCAPTANS. (Eng.) Doizaki, W. M.; Zieve, L. (Minneapolis Veterans Hosp., Univ. Minnesota, Minneapolis, MN 55417). *J. Lab. Clin. Med.* 90(5):849-855; 1977.

An improved method for measuring blood methanethiol (MT), in which zinc was used as a reducing agent and a more sensitive gas chromatograph was employed, is described. The method can be used for measuring covalently bound MT that was not previously detected and permits determinations in patients for the first time. The average normal whole-blood MT in rat blood was 200 ± 42 pmol/ml and in human blood 229 ± 29 pmol/ml. Eleven rats in experimental hepatic coma following acute massive hepatic necrosis had blood levels 4 to 18 times the average normal, and seven cirrhotic patients with hepatic encephalopathy or coma had blood levels 4 to 5 times the average normal.

2433 IN VITRO CELL-MEDIATED CYTOTOXICITY IN PRIMARY BILIARY CIRRHOSIS AND CHRONIC HEPATITIS: DYSFUNCTION OF SPONTANEOUS CELL-MEDIATED CYTOTOXICITY IN PRIMARY BILIARY CIRRHOSIS. (Eng.) Vierling, J. M.; Nelson, D. L.; Strober, W.; Bundy, B. M.; Jones, E. A. (Natl. Inst. Health, Bethesda, MD 20014). *J. Clin. Invest.* 60(5):1116-1128; 1977.

The *in vitro* cytotoxic function and target cell specificity of peripheral blood lymphocytes from 10 patients with primary biliary cirrhosis and 9 with hepatitis B surface antigen-negative chronic hepatitis were investigated using ^{51}Cr-labeled human Chang and EL-4 mouse sarcoma cell targets in assays of spontaneous cell-mediated cytotoxicity (SCMC) and mitogen-induced cellular cytotoxicity (MICC). In addition, antibody-dependent cellular cytotoxicity (ADCC) against Chang cells was assessed. At an effector-to-target cell ratio of 100:1, the mean SCMC against Chang cells was much less in patients with primary biliary cirrhosis than that in either the 11 healthy controls ($p<0.001$) or the patients with chronic hepatitis ($p<0.005$), whereas the value for patients with chronic hepatitis did not differ significantly from that of the controls. The mean SCMC against EL-4 mouse sarcoma cells was also less in patients with primary biliary cirrhosis than in the controls ($p<0.005$), whereas the value for chronic hepatitis was not significantly different from that of the controls or patients with primary biliary cirrhosis. In contrast, MICC against both targets and ADCC against Chang cells were similar for each group. Comparison of SCMC and MICC against both target cells, measured simultaneously, showed similar cytotoxic potential against both target cells for each group. Effector cells capable of mediating cytotoxicity in each assay were defined by testing the cytotoxic function of lymphocyte subpopulations isolated from two representative patients with each disease using immunoabsorbent affinity chromatography and crystallizable fragment (Fc) receptor binding to antigen-antibody complexes. In both primary biliary cirrhosis and chronic hepatitis, SCMC and ADCC were mediated by a subpopulation of lymphocytes that lack surface immunoglobulin (sIg-) and bear Fc receptors (Fc+). In contrast, MICC was mediated by sIg-cells, which lack Fc receptos. Lymphocytes bearing sIg were not cytotoxic in any assay. These results establish that there is a difference in cytotoxic function in primary biliary cirrhosis and chronic hepatitis by defining the presence of a defect in spontaneous cytotoxic function of sIg-, Fc+ lymphocytes against Chang cells in primary biliary cirrhosis.

2434 MACROMOLECULAR LACTATE DEHYDROGENASE LINKED TO SERUM IgG OF A PATIENT WITH LIVER CIRRHOSIS. (Eng.) Hayashi, S.; Noma, K.; Kobayashi, R.; Kosaka, K. (Okayama Univ. Medical Sch., Okayama 700, Japan). *Acta Med. Okayama* 30 (2):75-86; 1976.

An anomalous zymogram of LDH in the serum from a patient with liver cirrhosis is reported. Agar gel electrophoresis of serum showed an extra LDH band close to the anodic side of LDH5 and a wide band of LDH5. Gel filtration of the patient's serum in Sephadex G-200 demonstrated an abnormal LDH fraction eluted between IgG and macroglobulin in addition to a normal LDH component. Chromatographically abnormal LDH was demonstrated on agar gel as extra and wide LDH5 bands and resembled closely human hepatic LDH in its inhibition by urea or substrate, its stability against heat, and its K_m. Immunological analyses demonstrated that abnormal LDH could be in the state combined with IgG. The molecular weight of the complex estimated by gel filtration was approximately 300,000. Mixtures of the patient's heated serum with either normal or patient's hepatic LDH showed an abnormal LDH fraction by gel filtration, whereas the abnormal

fraction was not demonstrated when heated normal serum was mixed with either normal or the patient's hepatic LDH. These results strongly suggest that the occurrence of an anomalous LDH zymogram in the patient's serum is due to a formation of LDH-IgG complex, which is based on the binding of essentially normal hepatic LDH and abnormal IgG.

2435 POTASSIUM AND MAGNESIUM DEPLETION IN PATIENTS WITH CIRRHOSIS ON MAINTENANCE DIURETIC REGIMES. (Eng.) Wheeler, P. G.; Smith, T.; Golindano, C.; Alam, A. N.; Wilkinson, S. P.; Edmonds, C. J.; *et al.* (King's Coll. Hosp. and Medical Sch., Denmark Hill, London, England). *Gut* 18(9):683-687; 1977.

Total body potassium (^{40}K) and WBC potassium measurements were carried out in 19 patients with stable but decompensated cirrhosis maintained on diuretics for previous ascites. WBC magnesium was measured simultaneously with WBC potassium to determine whether magnesium depletion occurs in association with potassium depletion. Of 13 patients receiving spironolactone alone, none had a total body potassium below the expected lower limit of normal (3.5-5.0 mmol/l). Of six patients who were receiving frusemide (40 or 200 mg/day) together with spironolactone, two had low values. The results for WBC potassium were in agreement, and simultaneous measurements of WBC magnesium showed a close correlation, those with intracellular potassium depletion also having magnesium depletion. One such patient was treated with magnesium supplements (30 mmol/day, 1 month) without effect on the potassium level, although intracellular magnesium was improved. It is concluded that spironolactone alone is the treatment of choice in the maintenance management of such patients, that additional potassium would be unnecessary, and that additional frusemide should be avoided if possible.

2436 DIAGNOSIS OF LIVER CIRRHOSIS. (Rus.) Khazanov, A. I. (No affiliation given). *Sov. Med.* (12):44-47; 1976.

2437 MORPHOLOGY AND DIFFERENTIAL DIAGNOSIS OF PRIMARY BILIARY CIRRHOSIS AND ITS PRECIRRHOTIC STAGES. (Ger.) Roschlau, G. (Medizinische Akademie "Carl Gustav Carus," Fetscherstr. 74, DDR-8019 Dresden, E. Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(3/4):113-115; 1976.

2438 COMPARATIVE STUDY AND DIAGNOSTIC VALUE OF IMMUNOGLOBULINS AND SERUM GAMMA-GLOBULINS IN CIRRHOSIS. (Fre.) Tranchant, D.; Quatre, J. L.; Pichot, J.; Chauvire, F.; Lux, J.; Vachon, A. (Service de Biochimie, Hotel-Dieu, France). *J. Med. Lyon* 57(1306):563-571; 1976.

2439 DIAGNOSTIC VALUE OF THE STUDY AND DETERMINATION OF ANTIMITOCHONDRIAL ANTIBODIES IN PRIMARY BILIARY CIRRHOSIS [Abstract]. (Fre.) Remacle, J. P.; Chamlian, A.; Mathieu, B.; Monges, H. (Hopital Nord, 13326 Marseille Cedex 3, France). *Gastroenterol. Clin. Biol.* 1(5):489; 1977.

2440 VALUE OF SERUM PREALBUMIN DETERMINATION IN THE DIAGNOSIS OF LIVER CIRRHOSIS: PRELIMINARY RESULTS [Letter to Editor]. (Fre.) Savoye, B.; Pillon, M.; Girard, M.; Vernet-Nyssen, M.; Dorche, J. (Hopital de la Croix Rousse, 93, Grand Rue de la Croix Rousse, F 69317 Lyon Cedex 1, France). *Nouv. Presse Med.* 6(22):1973-1974; 1977.

2441 PANCREATICOPERITONEAL FISTULA DIAGNOSED IN AN INFANT WITH HEMORRHAGIC ASCITES. (Fre.) Navarro, J.; Guran, P.; Boureau, M.; Nicoladze, D.; Weisgerber, G.; Roussel, P.; Perrier, M. (Hopital Trousseau, 75012 Paris, France). *Arch. Fr. Pediatr.* 34(3):258-264; 1977.

2442 DIFFICULT CASES OF INTERPRETATION OF SPLENOPORTOGRAMS IN CHILDREN WITH PORTAL HYPERTENSION. (Rus.) Leontiev, A. F.; Markov, B. A.; Osipov, Yu. N. (Clinic Surgery, Inst. Pediatrics, USSR Acad. Medical Sciences, Moscow, USSR). *Vestn. Rentgenol. Radiol.* (2):52-58; 1977.

2443 IS TREATMENT NECESSARY FOR CIRRHOTIC ASCITES? (Fre.) Caulin, C.; Wagner, J. C.; Lamotte, M. (Hopital Lariboisiere, 2, rue Ambroise-Pare, 75475 Paris Cedex 10, France). *Sem. Hop. Ther.* 53(1):55-56; 1977.

2444 DEMECLOCYCLINE TREATMENT OF LIVER CIRRHOSIS PATIENTS FOR WATER AND MINERAL RETENTION. (Fre.) de Troyer, A.; Zegers de Beyl, D.; Demanet, J. C. (Hopital Universitaire Saint-Pierre, Brussels, Belgium). *J. Urol. Nephrol. (Paris)* 83(4/5):302-306; 1977.

2445 THE EFFECT OF DIURETIC THERAPY ON ACID-BASE EQUILIBRIUM AND ELECTROLYTE CONTENT IN PATIENTS WITH LIVER CIRRHOSIS AND ASCITES. (Rus.) Loginov, A. S.; Sakharova, T. N. (Central Scientific Res. Inst. Gastroenterology, Moscow, USSR). *Sov. Med.* (12):53-59; 1976.

2446 MORPHOLOGICAL SUBSTANTIATION OF LIVER CIRRHOSIS TREATMENT WITH RETABOLIL. (Rus.) Ryabinina, N. E.; Markov, R. M. (Dept. Pharmacology, Chelyabinsk Medical Inst., Chelyabinsk, USSR). *Farmakol. Toksikol.* 39(5):625-627; 1976.

2447 RESULTS OF CONSERVATIVE AND SURGICAL TREATMENT OF ASCITES. (Ger.) Schimmelpfennig, W.; Burger, K.; Schneider, G.; Wagner, K.; Luning, M. (II. Medizinische Klinik des Bereichs Medizin, Humboldt-Universitat, Schumannstr. 20/21,

DDR-104 Berlin, E. Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(3/4):157-158; 1976.

2448 ANALYSIS OF 28 CASES OF MESENTERIC-CAVAL ANASTOMOSIS WITH PROSTHESIS IN PATIENTS WITH HEMORRHAGE OR ASCITES DUE TO LIVER CIRRHOSIS [Abstract]. (Ita.) Goffrini, P. A.; Peracchia, A.; Morosini, S.; Roncoroni, L.; Sgobba, G.; Violi, V. (No affiliation given). *Rass. Int. Clin. Ter.* 57(7):497; 1977.

2449 CORRELATION BETWEEN THE CLINICAL COURSE AND THE HISTOLOGICAL PICTURE FOLLOWING SURGERY FOR PORTAL HYPERTENSION DUE TO CIRRHOSIS [Abstract]. (Ita.) Sgobba, G.; Violi, V.; Beduschi, G.; Roncoroni, L.; Morosini, S.; Peracchia, A. (No affiliation given). *Rass. Int. Clin. Ter.* 57(7): 497; 1977.

2450 PORTACAVAL ANASTOMOSIS IN CIRRHOTIC PATIENTS WITH PORTAL HYPERTENSION: PERSONAL EXPERIENCE. (Ita.) Bucciarelli, G.; Bertini, D.; Biliotti, G. C.; Bechi, P.; Bicchielli, E.; Stefani, P.; Celiberti, A. (Istituto di Clinica Chirurgica e Terapie Chirurgica, Universita di Firenze, Florence, Italy). *Ann. Ital. Chir.* 48(2):189-208; 1976.

2451 MODERN ASPECTS OF SURGERY IN PORTAL HYPERTENSION. (Ger.) Bengmark, S.; Borjesson, B. (Chirurgische Universitatsklinik, S-22185 Lund, Lasarettet, Sweden). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(3/4):165-169; 1976.

2452 INFLUENCE OF THE INFUSION OF AMMONIA LEVEL-REDUCING AMINO ACIDS ON THE DETOXIFYING CAPACITY OF THE LIVER IN PATIENTS WITH LIVER CIRRHOSIS WITH OR WITHOUT PORTAL ENCEPHALOPATHY. (Ger.) Muting, D.; Reikowski, J.; Horbach, L. (Heinz-Kalk-Klinik fur Innere Medizin, Bad Kissingen, W. Germany). *Therapiewoche* 26(37):5654-5667, *passim;* 1976.

2453 LIFE EXPECTANCY OF LIVER CIRRHOSIS PATIENTS TREATED CONSERVATIVELY AND WITH THE USE OF ORGAN ANASTOMOSES. (Rus.) Afanisieva, K. A. (Dept. Internal Diseases of Pediatric Faculty, A. V. Lunacharskii Astrakhan Medical Inst., Astrakhan, USSR). *Klin. Med. (Mosk.)* 54(7):88-91; 1976.

2454 PORTACAVAL SHUNT IN THE TREATMENT OF PORTAL HYPERTENSION WITH SPECIAL REFERENCE TO THE ARTERIALIZATION OF INTRAHEPATIC PORTAL CIRCULATION. (Ger.) Wolff, H. (Medizinische Akademie "Carl Gustav Carus," Fetscherstr. 74, DDR-8019 Dresden, E. Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(3/4):175-176; 1976.

2455 ETIOLOGY, SHORT-TERM PROGNOSIS AND TREATMENT OF HEMORRHAGE OF THE UPPER SEGMENT OF THE GASTROINTESTINAL TRACT IN CIRRHOTIC PATIENTS: REPORT OF 100 CASES. (Fre.) Doffoel, M.; Coumaros, D.; Girard, M.; Dauchel, J.; Bockel, R. (Centre Hospitalo-Universitaire, 67005 Strasbourg, France). *Rev. Fr. Gastroenterol.* (127):25-38; 1977.

2456 CLINICAL AND THERAPEUTIC ASPECTS OF PORTAL HYPERTENSION FROM THE VIEWPOINT OF INTERNAL MEDICINE. (Ger.) Schneider, G.; Burger, K.; Schimmelpfennig, W.; Wagner, K.; Zimmermann, H. B. (II. Medizinische Klinik der Charite,. Schumannstr. 20/21, DDR-104 Berlin, E. Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(3/4):163-164; 1976.

2457 PRIMARY BILIARY CIRRHOSIS ASSOCIATED WITH RHEUMATOID POLYARTHRITIS AND ACUTE POLYMYOSITIS. (Fre.) Benoist, M.; Henin, D.; Kahn, M. F.; Benhamou, J. P. (Hopital Bichat, 170 bd Ney, F 75877 Paris Cedex 18, France). *Nouv. Presse Med.* 6(27):2427-2429; 1977.

2458 HEMORRHAGE OF ESOPHAGEAL VARICES IN PORTAL HYPERTENSION. (Ger.) Schmidt, H. D.; Brunner, H.; Loth, R.; Wendling, P.; Gunther, M.; Farack, P. (Chirurgische Klinik, Universitat Mainz, Langenbeckstr. 1, D-6500 Mainz, W. Germany). *Munch. Med. Wochenschr.* 119(9):299-304; 1977.

2459 BLOOD CLOTTING CHANGES IN PORTAL HYPERTENSION. (Ger.) Jablonska, M.; Doskova, M.; Balas, V.; Richter, V.; Souckova, E. (IV. Innere Klinik, Karls-Universitat, U. nemocnice 2, CSSR-12 000 Prague 2, Czechoslovakia). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(3/4):151-152; 1976.

2460 LIVER HISTOLOGY IN VARIOUS FORMS OF PORTAL HYPERTENSION. (Ger.) Schmid, M. (Stadtspital Waid, Tiechestr. 99, CH-8037 Zurich, Switzerland). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(3/4): 147-149; 1976.

2461 PLASMA COTRIMOXAZOLE LEVELS IN PATIENTS WITH HEPATIC INSUFFICIENCY. (Ita.) Angelucci, L.; Baldieri, M.; Barba, C.; Lentini, S.; Linari, G.; Stocchi, F. (Istituto di Farmacologia e Farmacognosia, Facolta di Farmacia, Universita di Roma, Rome, Italy). *Clin. Ter.* 81(2):111-122; 1977.

2462 CHANGES IN THE EXOCRINE FUNCTION OF THE PANCREAS IN PATIENTS WITH LIVER CIRRHOSIS AND CHRONIC HEPATITIS. (Ger.) Brailski, Ch.; Mendisova, A.; Braikow, N.; Diwok, K. (Institut fur Gastroenterologie, Ul belo more 7, Sofia/VR, Bulgaria). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(5/6):269-274; 1976.

2463 EXOCRINE FUNCTION OF THE PANCREAS IN LIVER CIRRHOSIS AND CHRONIC HEPATITIS.

(Ger.) Diwok, K.; Curschmann, D.; Rostock, K.; Brailski, Ch. (Klinik fur Innere Medizin der Wilhelm-Pieck-Universitat, Ernst-Heydemann-Strasse, DDR-25 Rostock 1, E. Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(5/6):275-280; 1976.

2464 IMMUNOLOGICAL OBSERVATIONS IN PRIMARY BILIARY CIRRHOSIS AND LUPOID HEPATITIS. (Ger.) Loginov, A. S. (Zentrales Forschungsinstitut fur Gastroenterologie, Chaussee der Enthusiasten 200, 111 123 Moscow, USSR). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(3/4):117-119; 1976.

2465 MONOCLONAL IMMUNOGLOBULINS IN CHRONIC LIVER DISEASES. (Ger.) Zimmermann, S.; Kratzsch, K. H.; Lewicki, I. (Bezirkskrankenhaus, Burgerstr. 2, DDR-90 Karl-Marx-Stadt, E. Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(3/4):135-136; 1976.

2466 PATHOGENESIS OF DISORDERS OF VITAMIN B_{12} ABSORPTION IN THE INTESTINE OF LIVER CIRRHOSIS PATIENTS. (Rus.) Agzamkhodzhaev, S. M.; Verniaeva, T. I. (Tashkent Medical Inst., Tashkent, USSR). *Med. Zh. Uzbek.* (11):52-55; 1976.

2467 INTERACTIONS BETWEEN THE SPLEEN AND LIVER. (Ger.) Trux, F.; Sundermann, A. (Medizinischen Akademie, Nordhauser Strasse 74, DDR-50 Erfurt, E. Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 36(5/6):293-298; 1976.

See also, 1900, 1909, 2010, 2331, 2349, 2372, 2402, 2410, 2412, 2414, 2415, 2524, 2535.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

2468 GREY-SCALE ULTRASONOGRAPHY OF PORTAL VEIN. (Eng.) Webb, L. J.; Berger, L. A.; Sherlock, S. (Royal Free Hosp., Pond St., Hampstead, London NW3 2QG, England). *Lancet* 2(8040):675-677; 1977.

The results of gray-scale ultrasonography of the portal vein were compared with those of splenic venography or superior mesenteric arteriography. The state of the extrahepatic portal venous system was correctly assessed by grey-scale ultrasonography in 21 patients with extrahepatic portal vein obstruction tested, and the results agreed with those obtained by portal venography. In all 22 age-matched controls, a patent portal vein was displayed. The diameter of the portal vein on the ultrasound scan was significantly less in the 22 controls than in 18 patients with chronic liver disease. Grey-scale ultrasonography is a reliable, inexpensive, and noninvasive method for diagnosing extrahepatic portal vein obstruction.

2469 HISTOPATHOLOGICAL STUDIES ON THE PROGNOSIS OF BILIARY ATRESIA. (Eng.) Chiba, T. (Tohoku Univ. Sch. Medicine, Sendai 980, Japan). *Tohoku J. Exp. Med.* 122(3):249-258; 1977.

Liver specimens from 68 patients with biliary atresia were examined to correlate histology with the postoperative prognosis. The histological findings were classified by the degree of fibrosis, bile duct proliferation, bile plugs, giant cell transformation, and intralobular cholestasis. Morphometrical studies of the interstitial area, bile duct (ductules), intrahepatic portal vein, and intrahepatic artery were carried out and correlated with the age of the patients and with operative results. Marked fibrosis (cirrhosis) and interstitial areas occupying more than 35% of the sectional area of the liver specimen were indicative of a poor prognosis. Other factors that indicated poor postoperative bile excretion included (a) severe ductular proliferation, shown by proliferated bile ducts occupying more than 20% of interstitial areas, (b) no or slight intralobular cholestasis, and (c) marked interlobular cholestasis.

2470 CONTROLLED STUDY OF CHENODEOXYCHOLIC ACID AS A CHOLERETIC AGENT. (Eng.) Salvioli, G. F.; Zambarda, E.; Frigerio, G. (Inst. Internal Medicine, Univ. Modena, Modena, Italy). *Curr. Ther. Res.* 22(3):529-535; 1977.

A controlled double-blind trial was carried out in 12 patients after cholecystectomy to study the choleretic activity of chenodeoxycholic acid (CDCA) and of its combination with fentonium bromide. The patients received either placebo (control), 250 mg dehydrocholic acid (DHCA, as a reference drug), 250 mg chenodeoxycholic acid (CDCA), or 125 mg CDCA plus 20 mg fentonium bromide, all in capsule form. Each preparation was administered in a total dose of four capsules, one at 8 a.m., one at 11 a.m., one at 2 p.m., and one at 5 p.m. On the test day, the bile was collected from biliary fistula (T-tube) for periods of 24 hr starting from 8 a.m., on the assumption that after 4 to 5 days the external flow has a good correlation with the total flow.

The observations were carried out according to a balanced incomplete blocks design, comparing two preparations in each patient. The statistical analysis was performed using the intra-block information to adjust the means and the deviances of the experimental data. The drugs showed significant ($p<0.01$ or $p<0.05$) choleretic effects compared to placebo, whereas small and not significant differences between drugs were ascertained. The combination of CDCA and fentonium bromide, although containing a half dose of CDCA, produced a similar effect to the other active preparations. No side-effects occurred.

2471 RADIOLOGIC EVALUATION OF THE BILE DUCTS CONDITION AFTER SURGERY FOR CHOLELITHIASIS. (Pol.) Zalewski, J.; Szmurlo, J.; Bernacki, E.; Markiewicz, W. (Clinic Gastroenterological Surgery, Inst. Surgery, Bialystok, Poland). *Pol. Tyg. Lek.* 32(10):385-388; 1977.

Postoperative cholangiography provides valuable information on anatomy of the bile ducts, condition and function of papilla, and is a test for correctly performed surgery. The test was performed on 534 patients fasted with Kehr's T-drains in the common bile duct on the 10-12th postoperative day. In each subject, three to four cholangiograms were made, and the last one was focused on the papilla. Correct shape, width, and arrangement of the bile ducts and passage of the radio-opaque substance into the duodenum were observed in four of eight patients. In 20% of the patients with plastics of the papilla, intrahepatic bile ducts were not visualized, and the passage of the contrast substance into duodenum was unhampered. In 22 patients, concretions overlooked during surgery were detected. Dilatation of the bile ducts was observed in 43 subjects with inflammatory contraction of the papilla. This diagnosis was of great practical significance, and prolonged external drainage was employed. Complete obstruction of the terminal part of common bile duct was found in 15 patients after surgery for carcinoma of the head of pancreas or duodenal papilla. Deposition of the contrast substance in the terminal part of Wirsung's duct was detected in 194 subjects, although its cause was not known. Properly performed cholangiography is safe and painless. It is an important test of prognostic significance.

2472 PITFALLS IN SERUM BILE ACID ANALYSIS IN PATIENTS WITH CHOLESTASIS: DIFFERING BIOCHEMICAL PROPERTIES OF 3-HYDROXYSTERIOD DEHYDROGENASES FROM WILD-TYPE AND MUTANT Ps. testosteroni. (Eng.) Bolt, M. G.; Boyer, J. L. *In: Bile Acid Metabolism in Health and Disease.* Edited by G. Paumgartner and A. Stiehl. (Baltimore: University Park Press): 285-292; 1977.

The use of mutant *P. testosteroni* for the photofluorometric measurement of serum bile acids from patients with cholestasis resulted in values that were 30 to 50% lower than those obtained with wild-type *P. testosteroni*. The reason for this discrepancy was studied. Differences in substrate specificity for the unesterified 3β-OH group in the assay of cholestatic sera did not contribute to the difference. Rather, the discrepancy was due to a low affinity of the mutant enzyme for bile acid substrates and NADH degradation catalyzed by both the mutant and wild-type enzymes. The low affinity of the mutant enzyme can be abolished in assay systems that are of high ionic strength; there will be a concomitant slight decline in maximum velocity. The enzyme-associated degradation of NADH can be prevented by the use of hydrazine, either as the hydrate or the sulfate, or by further purification of the enzyme on Sephadex G-200. The data indicate that differences in biochemical properties between mutant and wild-type *P. testosteroni* must be considered if they are to be used with validity in the assay of bile acids. Optimal assay conditions using the two sources of enzyme may not always be interchangeable.

2473 INTERMITTENT CHOLESTATIC JAUNDICE AND NONMETASTATIC PROSTATIC CARCINOMA. (Eng.) Reddy, A. N.; Grosberg, S. J.; Wapnick, S. (Brooklyn Veterans Admin. Hosp., 527/111, Brooklyn, NY 11209). *Arch. Intern. Med.* 137(11):1616-1617; 1977.

A patient with intermittent cholestatic jaundice and metastatic prostatic adenocarcinoma that had spared the liver and extrahepatic biliary tree is described. He had puzzling episodes of jaundice for 2.5 yr following a transurethral resection for the carcinoma. The results of appropriate investigations and an exploratory laparotomy performed during the patient's four antemortem hospitalizations were indicative of "recurrent intrahepatic cholestasis," the cause of which remained an enigma even after exploratory laparotomy. At autopsy, no evidence of hepatic metastases or extrahepatic biliary obstruction was found. Alcohol, hepatotoxic drugs, toxins, viral and chronic active hepatitis, hemolysis, and extrahepatic biliary obstruction were eliminated as causes of the jaundice. Intermittent intrahepatic cholestasis may be one of the nonmetastatic manifestations (nonmetastatic hepatopathy of malignancy) of prostatic adenocarcinoma.

2474 CLINICOPATHOLOGIC CLASSIFICATION OF CONGENITAL CYSTIC DILATATION OF THE COMMON BILE DUCT. (Eng.) Matsumoto, Y.; Uchida, K.; Nakase, A.; Honjo, I. (Kyoto Univ. Medical Sch., Sakyo-Ku, Kyoto, Japan). *Am. J. Surg.* 134(5):569-574; 1977.

Congenital cystic dilatation of the common bile duct was classified in 103 patients with a localized dilatation of the biliary passages who were treated at the Kyoto University Medical Center between 1970 and 1975. Of the 103, 101 had congenital cystic dilatation of the common bile duct (Alonso-Lej type I). These dilatations were classified into two subtypes, "infant type" and "adult type," based on the anatomic location and

clinical features. The infant type cyst was typically a large cyst of the choledochus and most common in infancy and childhood. The adult type cyst was a fusiform dilatation of the biliary tract, and most common in adults. Among the patients with the infant type cyst, six had a dilatation beginning in the intrapancreatic or retroduodenal portion of the common bile duct and ending below the level of the junction with the cystic duct, and seven had a dilatation rising as far as the common hepatic duct. Gallstones were present in four patients in the first category, and in one in the second category. Among the patients with the adult type cyst, 27 had dilatation involving the right and left hepatic ducts, and in 61 it involved the intrahepatic bile ducts together with the entire extrahepatic biliary system. Twenty-three patients in the first group had gallstones, and 47 in the second group had stones.

2475 THIN NEEDLE CHOLANGIOGRAPHY: EXPERIENCE WITH 50 PATIENTS. (Eng.) Goldstein, L. I.; Kadell, B. M.; Weiner, M. (Univ. California Los Angeles Center Health Sciences, Los Angeles, CA 90024). *Ann. Surg.* 186(5):602-606; 1977.

The diagnostic accuracy and safety of thin needle cholangiography (TNC) was assessed in 50 patients with obstructive jaundice or jaundice of obscure origin. TNC was performed using the Chiba needle. Obstructed ducts were successfully demonstrated in 100% of cases (29/29). Nonobstructed ducts were opacified in 12/21. Overall success was 82% (41/50). Two septic complications, which were documented by positive blood cultures for *Escherichia coli*, occurred. It is concluded that TNC is a highly reliable, easy, and safe procedure in the evaluation of the jaundiced patient. Accurate demonstration of the biliary anatomy by TNC provided important information that in 20% of all cases led to a change in diagnosis, avoidance of unnecessary procedures, and shortening of hospitalization. Failure to visualize nondilated biliary ducts occurred with advanced chronic liver disease or fatty liver.

2476 SURGICAL JAUNDICE IN INFANCY. (Eng.) Lilly, J. R. (Univ. Colorado Sch. Medicine, 4200 E. Ninth Ave., Denver, CO 80262). *Ann. Surg.* 186(5):549-558; 1977.

Surgical progress in the treatment of congenital malformations of the biliary system is reviewed. Kasai's hepatic portoenterostomy operation for biliary atresia is a most dramatic example of the revolutionary changes that this type of surgery has undergone in the last decade. Radical departures from conventional surgical treatment also have been advocated for choledochal cyst, Caroli's disease, congenital perforation of the bile ducts, and biliary hypoplasia. The lesions responsible for obstructive jaundice in the early months of life include biliary atresia, biliary hypoplasia, choledochal cyst, congenital dilatation of the intrahepatic bile ducts (Caroli's disease), inspissated bile plug, and congenital common bile duct perforation. In "correctable" biliary atresia (i.e., where the proximal bile ducts are patent but end blindly before the duodenum), the Roux-en-Y choledochojejunostomy is advocated, while the Kasai procedure is used in situations where the lumina of the ducts are obliterated. In biliary hypoplasia, hepatic portoenterostomy is recommended. Roux-en-Y choledochojejunostomy may be used in choledochal cyst and Caroli's disease. Simple peritoneal drainage and cholecystostomy are advocated in congenital common bile duct perforation.

2477 ENDOSCOPIC RETROGRADE CHOLANGIOGRAPHY OR ULTRASONOGRAPHY FOR CHOLEDOCHOLITHIASIS [Abstract]? (Eng.) Zimmon, D. S.; Kedsiora, J.; Clemett, A. R. (St. Vincent's Hosp., Medical Center, New York, NY). *Gastroenterology* 73(5):1257; 1977.

2478 ENDOSCOPIC MANAGEMENT OF BILIARY TRACT DISEASE: OPTIONS AND RESULTS [Abstract]. (Eng.) Zimmon, D. S.; Falkenstein, D. B.; Clemett, A. R. (St. Vincent's Hosp., New York, NY). *Gastroenterology* 73(5):1257; 1977.

2479 EFFECTS OF GALLBLADDER DISEASE AND FUNCTION ON GALLBLADDER BILE COMPOSITION [Abstract]. (Eng.) Trotman, B. W.; Abrams, R. H.; Soloway, R. D. (Univ. Pennsylvania Sch. Medicine, Philadelphia, PA). *Gastroenterology* 73(5):1250; 1977.

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2481 SEASONAL INCIDENCE OF IDIOPATHIC NEONATAL HEPATITIS (NH) AND BILIARY ATRESIA (BA) [Abstract]. (Eng.) Bangaru, B. S.; Gartner, L. M.; Lee, K. S.; Vaisman, S. L. (Albert Einstein Coll. Medicine, Bronx, NY). *Gastroenterology* 73(5):1211; 1977.

2482 EFFECTS OF PLANTAGO FIBRE ON SERUM LIPIDS AND FECAL COMPOSITION IN HYPERCHOLESTEROLEMIC PATIENTS [Abstract]. (Eng.) Tarpila, S.; Miettinen, T. A. (Second Dept. Medicine, Univ. Helsinki, Helsinki, Finland). *Scand. J. Gastroenterol.* 12(Suppl. 45):105; 1977.

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2484 WATER CONTENT OF GALLSTONES: BINDING, LOCATION AND CONTRIBUTION TO STONE COMPOSITION [Abstract]. (Eng.) Soloway, R. D.; Cheong,

E. L.; Trotman, B. W. (Univ. Pennsylvania Sch. Medicine, Philadelphia, PA). *Gastroenterology* 73(5):1247; 1977.

2485 ENERGY DISPERSIVE X-RAY (EDXA) AND ELECTRON SPECTROSCOPY FOR CHEMICAL ANALYSIS (ESCA) WITH DEPTH PROFILING SUGGESTS IDENTITIES AND LOCATIONS OF COMPOUNDS AND PIGMENT GALLSTONE STRUCTURE [Abstract]. (Eng.) Soloway, R. D.; Trotman, B. W.; Weston, N. E.; Ficca, J. F., Jr. (Univ. Pennsylvania Sch. Medicine, Philadelphia, PA). *Gastroenterology* 73(5):1248; 1977.

2486 SURGICAL MANAGEMENT OF CARCINOMA OF THE JUNCTION OF THE MAIN HEPATIC DUCTS. (Eng.) Fortner, J. G.; Kallum, B. O.; Kim, D. K. (Memorial Sloan Kettering Cancer Center, New York, NY). *Ann. Surg.* 184(1):68-73; 1976.

2487 GALLBLADDER DISEASE AND CHOLESTEROL LOWERING DRUGS. (Eng.) Anonymous. (No affiliation given). *S. Afr. Med. J.* 52(14):547; 1977.

2488 BILIARY β-GLUCURONIDASE ACTIVITY AND ITS INHIBITOR IN CHINESE WITH PIGMENT GALLSTONES [Abstract]. (Eng.) Chen, J. S.; Hsu, S. C.; Ho, K. J. (Natl. Taiwan Univ. Hosp., Taipei, Taiwan). *Fed. Proc.* 37(3):698; 1978.

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2496 A CONTRIBUTION TO THE DIAGNOSIS OF PANCREATIC TUMORS. (Pol.) Hornowski, S.; Olkowski, L.; Dzwonkowski, S. (Oddzialu Chirurgicznego Miejskiego Szpitala Zakaznego Nr 1, Warsaw, Poland). *Pol. Tyg. Lek.* 32(9):357-360; 1977.

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2499 RADIOISOTOPE SCANNING OF THE LIVER AND BILE TRACT IN DIAGNOSIS OF CHRONIC CHOLECYSTITIS. (Rus.) Makarova, Yu. Ya.; Nikolaeva, A. A. (Leningrad Sanitary-Hygienic Medical Inst., Leningrad, USSR). *Vestn. Khir.* (6):33-36; 1977.

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2511 ROWACHOL--A POSSIBLE TREATMENT FOR CHOLESTEROL GALLSTONES [Abstract]? (Eng.) Doran, J.; Keighley, M. R. B.; Bell, G. D. (City Hosp., Nottingham, England). *Gut* 18(11):A977; 1977.

2512 LOCAL INFUSION THERAPY FOR RADIOLUCENT RETAINED COMMON DUCT STONES USING SODIUM CHOLATE, HEPARINISED SALINE, AND PHYSIOLOGICAL SALINE [Abstract]. (Eng.) Bateson, M. C.; Bouchier, I. A. D. (Ninewells Hosp. and Medical Sch., Dundee, Scotland). *Gut* 18(11):A977; 1977.

2513 EFFICACY OF WITHDRAWAL FROM AND RESISTANCE TO CHENODEOXYCHOLIC ACID TREATMENT IN PATIENTS WITH GALLSTONES [Abstract]. (Eng.) Maton, P. N.; Iser, J. H.; Murphy, G. M.; Dowling, R. H. (Guy's Hosp. and Medical Sch., London, England). *Gut* 18(11):A976; 1977.

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ACID [Abstract]. (Eng.) Bateson, M. C.; Ross, P. E.; Murison, J.; Bouchier, I. A. D. (Ninewells Hosp. and Medical Sch., Dundee, Scotland). *Gut* 18(11): A976-A977; 1977.

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2524 γ-GLUTAMYLTRANSPEPTIDASE AND BILE SALTS IN CHOLESTATIC LIVER [Letter to Editor]. (Eng.) Busachi, C. A.; Mebis, J.; Desmet, V. J. (Academisch Ziekenhuis Sint Rafael, Minderbroedersstraat 12, B-3000 Leuven, Belgium). *J. Histochem. Cytchem.* 25(11):1283; 1977.

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2527 OBSTRUCTIVE JANUDICE OF THE INFANT: DIAGNOSTIC VALUE OF DUODENAL INTUBATION [Abstract]. (Eng.) Leao, E.; Penna, F. J.; Assis Ferreira, R.; Laitao Valadares Roquete, M.; Teles de Carvalho, A. S.; Mota, J. A. C. (No affiliation given). *Arq. Gastroenterol.* 14(3): 160; 1977.

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2529 DUODENOSCOPIC SPHINCTEROTOMY--THERAPY OF CHOICE IN POOR RISK PATIENTS WITH COMMON BILE DUCT STONES [Abstract]. (Eng.) Paul, F. (Zentrum fur Innere Med. der Justus-Liebig-Univ., Giessen, W. Germany). *Endoscopy* 9(3):192; 1977.

2530 TRANSPAPILLARY LONG STANDING TUBE FOR HEPATOBILIARY DRAINAGE [Abstract]. (Eng.) Wurbs, D.; Classen, M. (Allgemeines Krankenhaus Barmbek, Hamburg, W. Germany). *Endoscopy* 9(3): 192-193; 1977.

2531 SNARE BIOPSY OF THE PAPILLA OF VATER [Abstract]. (Eng.) Hagenmuller, F.; Wurbs, D.; Classen, M. (Allgem. Krankenhaus Barmbek, Rubenkamp 148, D-2000 Hamburg 60, W. Germany). *Endoscopy* 9(3):193; 1977.

2532 THE ENTEROHEPATIC CIRCULATION OF ALKALINE PHOSPHATASE (AP) IN PATIENTS WITH GALLSTONES [Abstract]. (Eng.) Warnes, T. W.; Hine, P.; Kay, G. (Manchester Royal Infirmary, Manchester, England). *Digestion* 16(4):333-334; 1977.

2533 METHODS OF INCREASING THE EFFICACY OF CHENIC ACID IN GALLSTONE PATIENTS [Abstract]. (Eng.) Northfield, T. C.; Maudgal, D. P. (St. George's Hosp. Medical Sch., London, England). *Digestion* 16(4):346; 1977.

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2535 RELATIONSHIP BETWEEN RATE-LIMITING ENZYMES OF HEPATIC CHOLESTEROL AND BILE ACID METABOLISM AND BILE LIPID COMPOSITION [Abstract]. (Eng.) Carulli, N.; Zironi, F.; Bosco, F.; Zambarda, E. (Istituti de Clinica Medica e Clinica Chirurgia, Universita di Modena, Modena, Italy). *Digestion* 16(4):325-326; 1977.

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2537 CHOLESTASIS INDUCED BY PAPILLARY LESIONS AS A LITHOGENIC FACTOR IN CALCIUM BILIRUBINATE GALLSTONE [Abstract]. (Eng.) Ono, K.; Shimano, M. (Hirosaki Univ. Faculty Medicine, Hirosaki, Japan). *Gastroenterol. Jpn.* 12(4): 335; 1977.

2538 PROBLEM OF CHOLANGIOGRAPHY IN THE DIFFERENTIATION BETWEEN INTRAHEPATIC CHOLESTASIS AND EXTRAHEPATIC OBSTRUCTION [Abstract]. (Eng.) Saisho, H.; Kimura, K. (Sch.

Medicine, Chiba Univ., Chiba, Japan). *Gastroenterol. Jpn.* 12(4):335-336; 1977.

2539 CHOLEPHILIC DYE METABOLISM IN CHOLESTASIS [Abstract]. (Eng.) Abei, T.; Hosaka, H. (Toho Univ. Sch. Medicine, Tokyo, Japan). *Gastroenterol. Jpn.* 12(4):337-338; 1977.

2540 ON THE PATHOPHYSIOLOGY OF THE PROLONGED SEVERE JAUNDICE AFTER BILIARY DRAINAGE [Abstract]. (Eng.) Yamauchi, H.; Sato, T. (First Dept. Tohoku Univ. Sendai, Japan). *Gastroenterol. Jpn.* 12(4):336; 1977.

See also, 1935, 2003, 2011, 2012, 2013, 2014, 2022, 2023, 2024, 2028, 2029, 2030, 2032, 2047, 2117, 2128, 2306, 2330, 2336, 2423, 2542, 2544, 2585, 2588.

GENERAL

2541 GASTROINTESTINAL COMPLICATIONS AFTER RENAL TRANSPLANTATION. (Eng.) Rosekrans, P. (Ikazia Hosp., Rotterdam, Netherlands). *Radiol. Clin. (Basel)* 47(1):32-43; 1978.

A total of 32 gastrointestinal complications were observed in 22 of 110 patients after renal transplantation. Gastrointestinal hemorrhage occurred in 12 patients, duodenal perforation in 1, *Candida* esophagitis in 6, severe hepatitis and liver failure in 8, pancreatitis in 2, abdominal fistulae and abscesses in 2, and ileus in 1. There were 9 fatalities as a result of these complications, and 7 of the deaths occurred among the 12 patients with severe gastrointestinal hemorrhage, as expressed by hematemesis and/or melena or bloody stools. Signs of liver failure were found in four patients with gastrointestinal hemorrhage; in three of these patients, this developed a few months after treatment of the bleeding, always after the development of Australia antigen-positive hepatitis. All three of these patients died, two in hepatic coma. The hepatitis B in these patients may have been the result of multiple blood transfusions received during the period of bleeding. Among the eight patients with severe hepatitis, four died in hepatic coma. Overall, upper gastrointestinal bleeding, particularly in combination with liver failure, was the principal cause of death in these patients. Two patients in this series were found to have malignancies, an adenocarcinoma of the stomach and a reticulum cell sarcoma localized in the brain and in the patient's own right kidney. These complications occurred 4 yr and 8 months, resp., after transplantation. The risk of solid tumor growth unmistakably increases as the time after transplantation increases.

2542 EFFECTS OF ABDOMINAL SURGERY ON THE DEVELOPMENT OF RADIATION ENTEROPATHY. (Eng.) LoIudice, T.; Baxter, D.; Balint, J. (Albany Medical Center Hosp., Albany, NY 12208). *Gastroenterology* 73(5):1093-1097; 1977.

A controlled, retrospective study of 105 patients was undertaken to ascertain whether or not abdominal surgery at any time before radiation therapy might result in an increased incidence of radiation enteropathy. Three groups of patients were studied; 24 had radiation enteropathy that developed an average of 12.5 months after radiation therapy, and 28 were matched controls without this complication. The records of a further group of 53 unmatched controls, who survived more than 2 yr after irradiation were also examined. In the group with radiation enteropathy, 18 (75%) had a history of prior surgery, whereas only 3 (10.7%) of the matched controls had been operated before irradiation (χ^2=3.52, $p<0.005$). The incidence of prior surgery in the unmatched control group was 13.2%. These data indicate that abdominal surgery before radiotherapy does increase the risk of subsequent development of radiation enteropathy.

2543 FECAL LEUKOCYTES IN ENTERIC INFECTIONS. (Eng.) Pickering, L. K.; DuPont, H. L.; Olarte, J.; Conklin, R.; Ericsson, C. (6400 W. Cullen St., Houston, TX 77030). *Am. J. Clin. Pathol.* 68(5): 562-565; 1977.

The value of the examination of stools for WBC as a diagnostic tool in enteric infections was examined. The feces of 90 adult and 200 pediatric patients were examined for the presence of fecal WBC and enteric pathogens during episodes of acute diarrhea. Fecal WBC were demonstrated in specimens from 24 of 35 patients with diarrheal stools from which a *Shigella* strain was isolated, and in 4 of 11 specimens from patients with stools from which *Salmonella* was isolated. A significantly ($p<0.001$) greater number of patients with *Shigella* isolated from their stools had fecal WBC when compared with 27 of 158 patients from whose stools no pathogen was isolated or to 8 of 56 patients from whose stools other bacterial and protozoal pathogens were isolated ($p<0.05$). An invasive bacterial strain was isolated from the stools of 18 patients, as determined by guinea pig eye testing. Eleven of 13 invasive *Shigella* isolates were associated with numerous fecal WBC, while none of five other invasive bacteria were related to WBC-

positive stools. WBC were rarely found in the stools of patients with diarrhea thought to be due to viruses (2/36), *Giardia lamblia* (0/6), *Entamoeba histolytica* (0/4), or toxigenic *Escherichia coli* (4/35). The lack of total correlation between the presence of WBC and recovery of an invasive pathogen reflects the complex interaction of enteric pathogens with their hosts.

2544 USE OF AN ELEMENTAL DIET (VIVONEX) IN THE MANAGEMENT OF BILE ACID-INDUCED DIARRHOEA. (Eng.) Nelson, L. M.; Carmichael, H. A.; Russell, R. I.; Atherton, S. T. (Royal Infirmary, Glasgow G4 OSF, Scotland). *Gut* 18(10): 792-794; 1977.

The effect of a low-fat containing elemental diet (Vivonex) on fecal bile acid excretion was studied in six patients with cholerheic diarrhea, two normal controls, and four patients with noncholerheic diarrhea. The total fecal bile acid excretion in the patients with bile acid-induced diarrhea was significantly reduced from 6.37 ± 1.64 mmol/24 hr to 2.70 ± 1.12 mmol/24 hr during Vivonex treatment ($p<0.05$). A marked improvement in the diarrhea of these patients occurred; the number of stools per day decreased, and there was less urgency associated with the diarrhea. No significant reduction in fecal bile acid excretion was observed for the control and noncholerheic diarrhea groups. A low-fat elemental diet may be valuable in the management of patients with bile acid-induced diarrhea unresponsive to other forms of therapy, and may be of particular value in patients with Crohn's disease.

2545 EXPERIMENTAL DIARRHOEA IN HUMAN VOLUNTEERS FOLLOWING ORAL ADMINISTRATION OF Clostridium perfringens ENTEROTOXIN. (Eng.) Skjelkvale, R.; Uemura, T. (Norwegian Food Res. Inst., P.O. Box 50 N-1432 As-NLH, Norway). *J. Appl. Bacteriol.* 43(2): 281-286; 1977.

Experimental diarrhea was produced in human volunteers by the administration of *Clostridium perfringens* enterotoxin in an effort to study the following questions: (a) the amount of enterotoxin needed to produce diarrhea, (b) the enterotoxin level in fecal samples after acute diarrhea, (c) changes in serum anti-enterotoxin titers after experimental diarrhea, and (d) the role of anti-enterotoxin in the prevention of diarrhea in enterotoxin-exposed subjects. The p.o. administration of purified enterotoxin to the volunteers provoked diarrhea and abdominal pain. Diarrhea occurred in one of two volunteers who received 8 mg of enterotoxin. All of five subjects given 10 and 12 mg of purified enterotoxin or crude enterotoxin developed symptoms. Passive hemagglutination anti-enterotoxin titers in serum increased in only five of nine volunteers after exposure to enterotoxin. As such levels of anti-enterotoxin can be detected in normal serum samples, titration of anti-enterotoxin may be of little use in diagnosing *C. perfringens* food poisoning. Enterotoxin was detected in all diarrheal fecal specimens, and the enterotoxin level varied from 0.2-16 µg/g. The detection of enterotoxin in diarrheal feces may be the most reliable diagnostic procedure in outbreaks of *C. perfringens* food poisoning.

2546 DOGMA AND DERMATITIS HERPETIFORMIS. (Eng.) Marks, J. M. (Royal Victoria Infirmary, Queen Victoria Rd., Newcastle upon Tyne NE1 4LP, England). *Clin. Exp. Dermatol.* 2(9):189-207; 1977.

Data from 120 patients with dermatitis herpetiformis (DH) seen in a 10-yr period were reviewed with reference to new discoveries in the field to demonstrate how the concept of DH has altered during the last decade. In these patients, the final diagnosis of DH was made from an overall impression, which took into account clinical symptoms, therapeutic response, histological examination, and the results of special tests. Dapsone response was essential for differentiation of DH from diseases not of the DH/pemphigoid group. The IgA test was performed on clinically uninvolved skin; IgA deposits were found in 53 of 55 patients. This test is a good screening procedure, but it should be used in conjunction with other diagnostic criteria. Some anomalies of the IgA test occurred, but their significance was uncertain. It is not known whether the enteropathy found in some patients with DH was celiac disease (CD). To answer this question more precise definition of CD is necessary.

2547 VITAMIN B_{12} ABSORPTION DETERMINED WITH A DOUBLE ISOTOPE TECHNIQUE EMPLOYING INCOMPLETE STOOL COLLECTION: RELIABILITY AND VALIDITY IN PERNICIOUS ANEMIA. (Eng.) Hjelt, K.; Munck, O.; Hippe, E.; Barenholdt, O. (Glostrup Hosp., Glostrup, Denmark). *Acta Med. Scand.* 202(5):419-422; 1977.

To evaluate the reliability of the vitamin B_{12} absorption test, the vitamin B_{12} (B_{12}) absorption was determined simultaneously with whole-body counting (FRB_{12}) and with a double isotope technique employing incomplete stool collection (FAB_{12}) in 19 control patients and 10 patients with pernicious anemia (PA). The test dose was administered p.o. and consisted of 8 ml of a 10 ml solution containing 0.5 µg of ^{58}Co-B_{12} (0.4 µCi) and 2 mg of $^{51}CrCl_3$ (20 µCi). Two milliliters of the solution were used as the standard. To permit following of the passage of the inabsorbable tracer ($^{51}CrCl_3$), 25 radiopaque pellets and 4 carmine tablets (2 g) were administered to the patients immediately after the test dose. Counting of a 3-4 ml specimen from one of the first two red stools was sufficient for calculation of FAB_{12}. The findings correlated closely with the FRB_{12} values ($r=0.99$, $N=39$, $p<0.001$). In the control subjects, the FAB_{12} averaged 74% (range 37-88). In the patients with PA given intrinsic factor (IF), the FAB_{12} averaged 40% (range 22-59). When IF was not given, FAB_{12} averaged 2% (range 0-9). The test, therefore, is a valid indicator of pernicious anemia. For the mean value of 74%, the standard deviation (S.D.) was 5%, corresponding to a coefficient of variation (CV) of 7%. In the patients not given IF, S.D. was 1% and CV 50%, and in those given IF, S.D. was 8% and CV 20%. These

results demonstrate that the test is as reliable as whole-body counting. Carmine tablets proved to be a good indicator of isotope-containing stool. The test is easy to perform and requires only a scintillation well-counter. No cooperation on the part of the patients is necessary. The test is also suitable for outpatients. Furthermore, it is independent of kidney function, and flushing with B_{12} is avoided.

2548 UNUSUAL AMYLOID BODIES IN HUMAN LIVER: ULTRASTRUCTURAL AND FREEZE-ETCHING STUDIES. (Eng.) Livni, N.; Behar, A. J.; Lafair, J. S. (Hebrew Univ.-Hadassah Medical Sch., Jerusalem, Israel). *Isr. J. Med. Sci.* 13(12):1163-1170; 1977.

An unusual presentation of amyloidosis in the liver is described in two patients with chronic, nonspecific pulmonary disease. Amyloid bodies, ranging from 3 to 20 μm in diameter and staining positive for Congo red, were found to be deposited between or within hepatocytes and, therefore, to be in a more direct spatial relationship to epithelial than to Kupffer or sinusoidal lining cells. The freeze-etching technique revealed that the average diameter of the amyloid fibrils was 15 nm and not 7 to 10 nm; this may have been due to the fact that this technique avoids shrinkage artifacts that follow fixation and dehydration. These observations suggest a possible role of parenchymal tissues in the formation of amyloid material.

2549 IMPROVED MICELLAR DISPERSAL OF DIETARY LIPID BY BILE ACIDS DURING REPLACEMENT THERAPY IN GROWTH HORMONE-DEFICIENT CHILDREN. (Eng.) Poley, J. R.; Smith, J. D.; Thompson, J. B.; Seely, J. R. (Kinderklinik der Universitat Ulm, Prittwitzstrasse 43, 7900 Ulm, Donau, W. Germany). *Pediatr. Res.* 11(12):1186-1191; 1977.

To determine whether human growth hormone (hGH) influences digestive processes in man, the composition of the aqueous (micellar) phase was studied during the digestion of two consecutive meals in five growth hormone-deficient individuals and in three controls, before and after replacement therapy with hGH. Before treatment, the average micellar bile acid concentration in the hGH-deficient individuals was 5.0 ± 0.6 mM (normal controls 6-15 mM) during the first meal, and 3.5 ± 0.9 mM (normal controls 5-10 mM) during the second meal. After 1 yr of treatment with hGH (2 U 3x/week for 10 days, thereafter 3 U/week), the mean micellar bile acid concentration increased to 9.7 ± 1.0 mM ($p<0.02$) during the first, and to 7.1 ± 0.3 mM ($p<0.01$) during the second meal. The micellar lipid concentration increased concomitantly with an increased micellar bile acid concentration (fatty acid: first meal 6.3 ± 0.6 mM to 13.0 ± 0.7 mM, $p<0.001$; second meal 4.5 ± 1.5 mM to 8.5 ± 0.3 mM, $p<0.05$; monoglyceride, as percentage of total fatty acids: first meal 25 ± 10 to 53 ± 7, $p<0.02$; second meal 31 ± 7 to 62 ± 6, $p<0.02$). Short-term treatment (10 days) of the controls did not affect the concentration of micellar bile acids and lipids. There was no significant difference in the physical state of bile acids and lipids between patients and control subjects before and after treatment.

2550 SERUM ALBUMIN LEVELS IN PATIENTS WITH THE ZOLLINGER-ELLISON SYNDROME. (Eng.) Lamers, C. B. H.; Hafkenscheid, J. C. M.; Yap, S. H.; van Tongeren, J. H. M. (Univ. Hosp. St. Radboud, Nijmegen, Netherlands). *Gastroenterology* 73(5):975-979; 1977.

The serum albumin concentrations in patients with the Zollinger-Ellison (ZE) syndrome were compared with the levels in normal controls and in patients with duodenal or stomal ulcers. Serum albumin concentrations in 20 patients with proved or presumed ZE syndrome (4.1 ± 0.8 g/100 ml) were significantly ($p<0.01$) lower than the levels observed in 40 normal controls (5.1 ± 0.3 g/100 ml), 40 duodenal ulcer patients (5.1 ± 0.4 g/100 ml), and 20 stomal ulcer patients (5.1 ± 0.3 g/100 ml). Six ZE patients with metastatic gastrinoma had slightly lower ($p<0.10$) serum albumin concentrations (3.5 ± 0.9 g/100 ml) than did 14 ZE patients without evidence of metastatic lesions (4.3 ± 0.7 g/100 ml). In a small group of patients studied more extensively, the mechanism of hypoalbuminemia was found to be complex. In addition to metastatic tumor growth, both gastrointestinal protein loss and impaired albumin synthesis may be factors in the pathogenesis of hypoalbuminemia. Inadequate nutrition was only evident in one patient with esophageal stricture and in two patients with extensive tumor growth after total gastrectomy. Total gastrectomy induced a rise in serum albumin in all eight patients studied ($p=0.01$). It is concluded that low serum albumin concentrations in peptic ulcer patients may be a clue to the diagnosis of ZE syndrome.

2551 POSSIBILITIES OF THE SURGICAL MANAGEMENT OF HEMORRHAGES OF THE UPPER GASTROINTESTINAL TRACT. (Fle.) Eyskens, E. (St. Vincentius Ziekenhuis, Universitaire Instelling Antwerpen, Universiteitsplein 1, B-2610 Wilrijk, Belgium). *Tijdschr. Gastroenterol.* 19(5):347-359; 1976.

2552 CHANGES IN THE VOLUME OF CIRCULATING BLOOD AND ITS COMPONENTS IN PATIENTS WITH GASTROINTESTINAL HEMORRHAGES. (Rus.) Ryabtsev, V. G.; Kaldybaev, M. A. (Dept. Surgery, I. M. Sechenov First Moscow Medical Inst., Moscow, USSR). *Sov. Med.* (3):73-77; 1977.

2553 DIAGNOSIS OF LAXATIVE ABUSE. (Fre.) Gendre, J. P.; Lecomte, A.; Potet, F.; Le Quintrec, Y. (Hopital Rothschild, 33, bd de Picpus, F 75571 Paris Cedex 12, France). *Nouv. Presse Med.* 6(14):1229-1232; 1977.

2554 DIARRHEA. (Ger.) Bohmer, R. (Abt. Klinische Chemie der Univ., Steinhovelstr. 9, 7900 Ulm, W. Germany). *Med. Welt.* 28(6):276-281; 1977.

2555 VALUE OF LOPERAMIDE (IMODIUM) IN THE TREATMENT OF CHILDREN WITH ACUTE DIARRHEA. (Fre.) Arnaud, J. P.; Griscelli, C. (C.H.U. Necker-Enfants Malades, 149, rue de Sevres, 75750 Paris Cedex 15, France). *Med. Infant.* 84(5):633-635; 1977.

2556 TREATMENT OF ACUTE INFECTIOUS DIARRHEA IN SMALL CHILDREN. (Fre.) Boissiere, H.; Saint-Jacques, I. (Hopital de Perpetuel Secours, 2, rue Kleber, 92309 Levallois-Perret, France). *Sem. Hop. Ther.* 53(4):227-230; 1977.

2557 ACUTE BACTERIAL DIARRHEA (PHYSIOPATHOLOGY AND TREATMENT). (Fre.) Aubertin, J.; Gonday, G.; Farret, O. (Hopital Pellegrin, 33076 Bordeaux-Cedex, France). *Rev. Prat. (Paris)* 27 (29):1901-1915; 1977.

2558 DRY LACTOBACTERIN TREATMENT OF CHRONIC ENTEROCOLITIS. (Rus.) Levin, A. A.; Tsimmerman, Ya. S.; Krasik, E. L.; Galiyanova, G. A. (Dept. Therapy, Perm Medical Inst., Perm, USSR). *Sov. Med.* (2):109-113; 1977.

2559 EXPERIENCE WITH A NEW DIET IN INFANTILE ENTERITIS. (Ger.) Hohenauer, L.; Praxmarer, C. (Landeskinderkrankenhaus, Krankenhausstrasse 26, A-4020 Linz, Austria). *Wien. Klin. Wochenschr.* 127(7):237-239; 1977.

2560 POSTOPERATIVE NECROTIZING ENTERITIS WITH Bacteroides fragilis (Ristella) SEPTICEMIA [Letter to Editor]. (Fre.) Freysz, M.; Lassauniere, J. M.; Genin, R.; Barault, J. F. (Hopital du Bocage, 2, avenue du Marechal de-Lattre-de-Tassigny, F 21034 Dijon Cedex, France). *Nouv. Presse Med.* 6(22):1976; 1977.

2561 DISORDERS OF DIPEPTIDASE ACTIVITY OF THE SMALL INTESTINE IN CHRONIC ENTERITIS AND THEIR TREATMENT. (Rus.) Linevsky, Yu. V. (Dept. Therapy, A. M. Gorkii Donetsk Medical Inst., Donetsk, USSR). *Klin. Khir.* 55(2):54-58; 1977.

2562 PROPHYLACTIC MEASURES TAKEN BY OSPEDALI RIUNITI DI MATERA IN CONNECTION WITH THE RECENT CHOLERA EPIDEMIC. (Ita.) Padula, A.; Annunziata, L. (Ospedali Riuniti di Matera, Divisione de Malattie infettive, 75100 Matera, Italy). *Minerva Med.* 68(3):197-200; 1977.

2563 CHOLEROID DIARRHEA IN A PATIENT WITH GANGLIONEUROBLASTOMA: DISCOVERY OF AN INCREASED PLASMA LEVEL OF VASOACTIVE INTESTINAL PEPTIDE (VIP). (Fre.) Ricour, C.; Duhamel, J. F.; Lesec, G.; Schweisguth, O. (Hopital des Enfants Malades, Paris, France). *Arch. Fr. Pediatr.* 34(6): 552-555; 1977.

2564 GANGLIONEUROBLASTOMA AND DIARRHEA DUE TO "VASOACTIVE INTESTINAL PEPTIDE" (V.I.P.) HYPERSECRETION. REPORT OF A NEW CASE [Letter to Editor]. (Fre.) Fontaine, J. L.; Girardet, J. P.; Bataille, D.; Lagardère, B.; Lemerle, J. (Hopital Trousseau, 75012 Paris, France). *Arch. Fr. Pediatr.* 34(6):577-578; 1977.

2565 EXPERIMENTAL STUDY OF BACTEREMIA AND ITS SIGNIFICANCE IN THE PATHOGENESIS OF DYSENTERY. (Rus.) Suptel, E. A.; Maximovich, N. A. (Kiev Scientific Res. Inst. Infectious Diseases, Ministry Public Health Ukrainian SSR, Kiev, USSR). *Arkh. Patol.* 39(2):17-22; 1977.

2566 CLINICOMORPHOLOGICAL SUBSTANTIATION OF IMMUNO-ANTIBIOTIC THERAPY OF PATIENTS WITH ACUTE DYSENTERY. (Rus.) Belov, G. F.; Kolesnikova, A. F.; Vakulin, G. M.; Gorbacheva, A. I. (Dept. Infectious Diseases, Novosibirsk Medical Inst., Novosibirsk, USSR). *Klin. Med.* 54(7):101-104; 1976.

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2568 A MICROBIAL FACTOR AND CELLULAR REACTIVITY IN PROTRACTED AND CHRONIC DYSENTERY IN CHILDREN. (Rus.) Speransky, N. P. (Leningrad Scientific Res. Inst. Childhood Infections, Leningrad, USSR). *Pediatriia* (3):12-15; 1977.

2569 CLINICO-MORPHOLOGICAL CHARACTERISTICS OF THE LARGE INTESTINE IN PERSONS HAVING SUSTAINED DYSENTERY. (Rus.) Shalygina, N. B.; Abubakirov, V. T.; Yushchuk, N. D. (Central Scientific Res. Inst. Epidemiology, USSR Ministry of Public Health, Moscow, USSR). *Klin. Med. (Mosk.)* 55(2):105-108; 1977.

2570 ULTRASTRUCTURE OF THE LARGE INTESTINAL MUCOSA IN PATIENTS WITH ACUTE DYSENTERY. (Rus.) Zufarov, K. A.; Musabaev, I. K.; Baibekov, I. M.; Rasulev, R. M. (Dept. Histology, Tashkent Medical Inst., Tashkent, USSR). *Med. Zh. Uzbek.* (1):34-39; 1977.

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2572 PATHOGENETIC MECHANISMS IN HEALTHY CARRIERS OF ENTEROPATHOGENIC Escherichia coli

AND IN E. coli INFECTION. (Rus.) Speranskii, N. P. (Dept. Intestinal Infections, Leningrad Scientific Res. Inst. Childhood Infections, Leningrad, USSR). *Pediatriia* (3):7-10; 1977.

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2613 SPECIFIC ANTI-E. coli BOVINE MILK IMMUNOGLOBULINS IN THE TREATMENT OF INFANTS WITH INTESTINAL E. coli INFECTIONS [Abstract]. (Eng.) Ballabriga, A.; Farriaux, J. P.; Hilpert, H.; Gerber, H.; Arcalis, L. (No affiliation given). *Acta Paediatr. Belg.* 29(2):126; 1976.

2614 GASTRO-INTESTINAL PASSAGE OF BOVINE ANTI-E. coli MILK ANTIBODIES IN HUMAN INFANTS [Abstract]. (Eng.) Hilpert, H.; Gerber, H.; De Peyer, E.; Nussle, D. (No affiliation given). *Acta Paediatr. Belg.* 29(2):125-126; 1976.

See also, 1697, 1770, 1966, 1980, 1992, 1995, 1998, 2000, 2030, 2034, 2044, 2045, 2047, 2051, 2052, 2053, 2156, 2157, 2158, 2191, 2240, 2241, 2509.

GENERAL

Parasitology

2615 HEPATIC AMEBIASIS, ANALYSIS OF 56 CASES. I. CLINICAL FINDINGS. (Eng.) Carneiro Chaves, F. J. Z.; Cruz, I.; Gomes, C.; Domingues, W.; Marques Da Silva, E.; Tavarela Veloso, F. (Hosp. de S. Joao, Porto, Portugal). *Am. J. Gastroenterol.* 68(2):134-140; 1977.

Clinical findings in 56 patients with hepatic amebiasis are reviewed. The clinical picture was dominated by abdominal pain (96.4%) localized in the right hypochondrium in 90.7% of the cases, fever (71.4%), anorexia (53.5%), weight loss (50%), tender hepatomegaly (85.7%), pain on percussion of the right hypochondrium (81.5%), and auscultatory abnormalities in the lower right lung field (71.4%). Mucosal edema (28.9%) and a granulated mucosa (28.9%) were the most frequent rectosigmoidoscopic findings in the 38 patients examined. Liver puncture biopsy and aspiration of abscesses were performed in 16 patients, and characteristic pus resembling anchovy sauce was obtained in 87.5% of these patients. Mild jaundice was observed in 35.7% of the patients and appeared to have no prognostic significance. The illness was most frequent in black men between the ages of 20 and 39 yr; 89.3% of the patients were men, 75% were black, and 70.9% were between 20 and 39 yr of age. Metronidazol (250 mg, p.o., for 10 days) was used to treat 15 patients; dehydroemetine (1 mg/kg, i.m., for 10 days) and tetracycline (1-2 g, p.o., for 14 days) were used to treat 31 patients; and chloroquine (750 mg/day, p.o., for 4-6 weeks) was given to 10 patients. Surgical intervention was necessary only when complications were present; however, even in a patient with a bronchohepatic fistula, complete recovery followed chemotherapy. Other, rarer complications, such as rupture into adjacent abdominal viscus, the pericardium, or the skin, were not observed.

2616 MASSIVE INFECTION WITH Fasciola hepatica IN MAN. (Eng.) Jones, E. A.; Kay, J. M.; Milligan, H. P.; Owens, D. (Natl. Inst. Arthritis, Metabolism, and Digestive Diseases, Natl. Inst. Health, Bethesda, MD 20014). *Am. J. Med.* 63(5):836-842; 1977.

The 6-yr clinical course of a patient who acquired a massive *Fasciola hepatica* infection is described. A peripheral blood eosinophilia was an almost constant finding throughout the illness. The patient may have been infected with a multiple of 40 adult flukes, as his fecal ova count (1,000/g) was 40 times greater than that of a subject with an asymptomatic infection. During the illness, cholecystectomy was carried out. The surface of the liver was studded with greyish white hard nodules. Histologically, there was a nonspecific chronic cholecystitis; a liver biopsy disclosed florid changes of large duct, biliary obstruction, granulomas, patchy periductular fibrosis, and an ovum morphologically similar to an ovum of *F. hepatica* surrounded by a granuloma. Three exacerbations of symptoms were associated with severe microcytic hypochromic anemia, possibly due to blood loss into the biliary tract. A course of bithionol was associated with rapid amelioration of symptoms and disappearance of ova from feces. No evidence of recurrence occurred during the following 2.5 yr. The infection was probably acquired by eating wild watercress containing encysted metacercariae. At a campsite frequented by the patient, a habitat suitable for the life cycle of *F. hepatica* was found, including snails of the genus *Limnaea truncatula*, which were shown to contain cercariae. The site is in a region with a high rainfall, a factor known to favor the life cycle of *F. hepatica*. Infection with this parasite should be considered whenever a clinical picture suggestive of biliary tract disease is associated with an eosinophilia.

2617 QUANTIFICATION OF THE LYMPHOCYTIC INFILTRATE IN JEJUNAL EPITHELIUM IN GIARDIASIS. (Eng.) Wright, S. G.; Tomkins, A. M. (Hosp. Tropical Diseases, St. Pancras Way, London NW1, England). *Clin. Exp. Immunol.* 29(3):408-412; 1977.

To determine if there is an increased number of intraepithelial lymphocytes in the jejunum of patients with giardiasis, these cells were counted in coded serial sections of both normal jejunum and jejunum from 40 patients with giardiasis. Patients with giardiasis and normal intestinal absorption and control patients who had lived and traveled in tropical areas had similar counts, which were higher than those reported for controls from temperate areas. Where giardiasis was accompanied by malabsorption of one substance, the mean count was significantly higher than that of controls ($p<0.02$). In those patients with giardiasis and malabsorption of two or three substances, the mean count was significantly higher than that of controls ($p<0.02$) and that of patients with giardiasis and normal absorption ($p<0.05$). After treatment, intraepithelial lymphocyte counts declined consistently in patients with malabsorption. There appears to be an association between raised intraepithelial lymphocyte counts and malabsorption.

2618 A STRANGE CASE OF ASTHENIA DUE TO THERAPY ON THE BASIS OF ERRONEOUS DIAGNOSIS IN A PATIENT WITH SCHISTOSOMIASIS. (Fre.) Simitzis-Le-Flohic, A. M.; Chastel, Cl.; Le Roy, J. P.; Mottier, D.; Bercovici, J. P. (Laboratoire de Bacteriologie-Virologie-Parasitologie, Faculte de Medecine, B.P. 815, 29279 Brest Cedex, France). *Sem. Hop. Paris* 53(22/23):1369-1370; 1977.

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2622 EPIDEMIOLOGICAL ANALYSIS OF OCCURRENCE OF HUMAN TAPEWORMS IN THE SLOVAK SOCIALIST REPUBLIC IN 1971-1974. (Cze.) Straka, S.; Sobota, K.; Beniat, T.; Giboda, M.; Kubicova, E. (Katedra Hygieny, Epidemiologie, Mikrobiologie a Socialneho Lakarstva, Lekarstkej Fakulty UK, Martin, Czechoslovakia). *Cesk. Epidemiol. Mikrobiol. Immunol.* 26(1):52-60; 1977.

See also, 1702, 1987, 1997, 2010, 2025, 2026, 2027, 2036, 2352, 2541, 2543.

GENERAL

Regional Enteritis

2623 ^{14}C-GLYCOCHOLATE TEST IN CROHN'S DISEASE--ITS VALUE IN ASSESSMENT AND TREATMENT. (Eng.) Scarpello, J. H. B.; Sladen, G. E. (Royal Hosp., West St., Sheffield, England). *Gut* 18(9):736-741; 1977.

The ^{14}C-glycocholic acid (^{14}C-GCA) test was assessed

in 27 patients who had resection of the ileum and colon for Crohn's disease and in 19 patients with unoperated stable Crohn's disease. The incidence of increased breath output of $^{14}CO_2$ and fecal output of ^{14}C was significantly greater in operated patients. Six operated patients had increased breath output alone, 8 had increased fecal output alone, and 12 had increased fecal and breath output, whereas the respective figures in 13 nonoperated patients were 2, 7, and 0. Half the unoperated patients had normal results and, of the others, a modest increase in fecal ^{14}C was the usual finding. There was no correlation between the ^{14}C-GCA test, the Schilling test, and the extent and severity of the radiological signs in the unoperated patients. Metronidazole therapy was poorly tolerated and had little or no influence on symptoms but did decrease the excretion of $^{14}CO_2$ in the breath when the ^{14}C-GCA test was repeated. Cholestyramine therapy was beneficial in the majority of resected patients with diarrhea and an increased fecal ^{14}C excretion, and, on repeat testing, there was a significant increase in the output of breath $^{14}CO_2$. The beneficial effect was less marked in the unoperated patients, and the breath $^{14}CO_2$ output remained normal in those retested. Interruption of the enterohepatic circulation of bile acids did not seem to make an important contribution to the symptoms of patients with stable unoperated (and uncomplicated) Crohn's disease, even when the ileum was extensively involved.

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2628 PARENTERAL FEEDING AND ELEMENTAL ENTERAL FEEDING IN THE TREATMENT OF CROHN'S DISEASE AND ULCERATIVE COLITIS IN CHILDREN. (Fre.) Ricour, C.; Duhamel, J. F.; Nihoul-Fekete, C. (Hopital des Enfants-Malades, 149, rue de Sevres, 75730 Paris, Cedex 15, France). *Arch. Fr. Pediatr.* 34(6):505-513; 1977.

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2126
ABRAHAMS, C.
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ABRAMS, G.D.
1984*
ABRAMS, R.H.
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ABRAMSON, J.
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ABUBAKIROV, V.T.
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ACCATINO, L.
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ACKERMAN, L.
1701
ACKERMANN, H.W.
2404
ADIBI, S.A.
1712*
ADLER, R.
1948
ADLOFF, M.
2284
ADRIAN, T.E.
1868
AFANISIEVA, K.A.
2453
AFIFI, F.
1934
AGZAMKHODZHAEV, S.M.
2466
AIMINO, R.
2019
AIZAWA, I.
1765*
AKCHURINA, M.K.
2375
AKHTAR, M.
2217
AKIMOVA, O.L.
2040
AKITA, M.
2281
AKSENOVA, N.Y.
2584
AL-IBRAHIM, M.
2089
ALALU, J.V.
2369
ALAM, A.N.
2435*
ALBANO, J.D.M.
1874
ALBERT, H.
2145
ALBERTI, K.G.M.M.
2420
ALBINUS, M.
1810*
ALBRECHT, D.
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ALDERETE, M.
2016
ALEXANDER-WILLIAMS, J.
2195, 2200, 2518
ALIANO, A.
2352
ALLEN, J.L.
1834
ALLEN, R.H.
1715*
ALLISON, M.E.M.
2013
ALONSO, J.M.
2580
ALTMAN, R.P.
2084
ALVAREZ, L.A.
1728*
AMADEO, J.H.
2152
AMDRUP, E.
2182
AMIR, B.
2350
AMMANN, R.
2286, 2313
AMMON, H.V.
1731
AMOURY, R.A.
2085
ANDERSEN, D.
2158, 2182
ANDERSON, C.B.
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ANDERSON, K.D.
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ANDERSSON, H.
1996*
ANDERTON, L.G.
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ANDRE, M.
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ANDREICHIN, M.A.
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ANGELUCCI, L.
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ANGORN, I.B.
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ANNONI, G.
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ANNUNZIATA, L.
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ANTAR, M.A.
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ANTES, G.
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ANURAS, S.
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ARCALIS, L.
2613
ARDILL, J.E.S.
2196
ARENDT, R.
2071*
ARIAS VALLEJO, E.
2355
ARKHIPOV, G.S.
2406
ARNAUD, J.P.
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ARNDORFER, R.C.
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AROMAA, U.
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ARORA, A.K.
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ARTIUKHOV, A.S.
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ASHCRAFT, K.W.
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ASLANIAN, I.A.
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ASSIS FERREIRA, R.
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ASTE, H.
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ATHANASOULIS, C.A.
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ATHERTON, S.T.
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AUBERTIN, J.
2557
AUCLAIR, C.
1934
AUDETAT, V.
2009
AUNE, S.
1784
AURIOL, M.
2595
AUTH, D.
1827
AVERUNO, P.
2137
BABALICH, A.K.
2492
BABUT, J.M.
2279
BACH, H.
2395
BACHMAN, S.
2163*
BADDELEY, R.M.
2518
BAEKGARD, N.
2179
BAGROS, P.
2397
BAIBEKOV, I.M.
2570
BAKER, L.W.
2063*
BAKER, R.
2199

BAKER, S.E.
2192
BALABAUD, C.
1922
BALAS, V.
2459
BALDI, F.
1817
BALDIERI, M.
2461
BALEVA, M.
2345
BALINT, J.
2542*
BALINT, J.A.
1725*
BALLABRIGA, A.
2613
BALLARD, J.
2231
BALSTER, U.
1912
BANDINELLI, C.
2341
BANG, F.B.
1958
BANGARU, B.S.
2481
BAR-MEIR, S.
1737
BARAN, D.
2303*
BARAULT, J.F.
2560
BARBA, C.
2461
BARBARA, L.
1817
BARBER, D.C.
1717*
BARBI, G.L.
2410
BARBIER, F.
2268
BARBIER, P.
2601
BAREISS, P.
2357
BARENHOLDT, O.
2547*
BARGHEON, J.
2266
BARIN, F.
2398
BARINSKY, I.F.
2402
BARNS, R.J.
1975
BARON, J.H.
1846, 2193
BARRERAS, R.F.
1834
BARTELSMAN, J.F.
2253
BARTOLETTI, L.
2396
BARTOLUCCI, E.
2427
BASLER, M.
1879*
BASTRUP-MADSEN, P.
2158
BATAILLE, D.
2564
BATESON, M.C.
2512, 2522
BAUDOUIN, H.
1866
BAUER, R.F.
1829
BAUM, S.
2236*
BAUMGARTEN, R.
2336
BAXTER, D.
2542*
BAYAZID, A.
2342
BEALES, D.
2311*
BEAU, A.
2279
BEAUCHANT, J.
2578
BECCHI, G.
2140
BECHI, P.
2450
BECHRAOUI, T.
2250
BECKER, C.
2041
BECKER, H.
2109
BECKER, H.W.
2041
BECKER, M.
1821
BECKERS, C.
2227
BECQ-GIRAUDON, B.
2577
BEDUSCHI, G.
2449
BEFLER, B.
2237*
BEGACHEV, V.B.
2500
BEHAR, A.J.
2548*
BEHAR, J.
1750*, 2066*
BEHMARD, S.
2090
BEISLAND, H.O.
2175
BEJOT, J.
2580
BELBER, J.P.
2225*
BELL, G.D.
1935, 2511
BELL, M.R.
1836
BELLOSO, R.
2352
BELOBORODOVA, E.I.
2583
BELOV, G.F.
2566
BELOZEROV, E.S.
2406
BELPAIRE, F.M.
1892*
BELSEY, R.
2100
BENGMARK, S.
2451
BENHAMOU, J.P.
2457
BENIAT, T.
2622
BENJAMIN, I.S.
2013
BENMAIR, Y.
1760*
BENNETT, A.
1755*
BENO, I.
2119
BENOIST, M.
2457
BENTLEY, J.F.R.
2160
BERCOVICI, J.P.
2618
BERCOVIER, H.
2580
BERDOV, B.A.
2162
BERENSON, M.
2088
BERGER, H.
1970, 2230
BERGER, L.A.
2468*
BERGLINDH, T.
1812*
BERGOMI, B.
1911
BERGONZI, L.
2194
BERLIN, B.P.
1744*
BERNACKI, E.
2471*
BERNER, J.
2254
BERNHARDT, H.
2226
BERNIER, J.J.
2212, 2293
BERSTAD, A.
1835, 1848
BERTE, L.E.
1748*
BERTINI, D.
2450
BESTERMAN, H.S.
1868
BEURLET, J.
2123
BEZPROZVANNY, B.K.
2402

BHANDARI, S.D.
1976
BHOOLA, K.D.
1874
BHOWN, M.
1793*
BIANCANI, P.
1750*
BIANCO, A.
2337
BICCHIELLI, E.
2450
BICOCCHI, S.
2360
BIEL DE LA M., F.
2026
BIELECKI, M.
2267
BIELLO, D.
2412*
BIELORAI, R.
1710*
BILICH, I.L.
2585
BILIOTTI, G.C.
2450
BINDER, H.J.
1708*
BIRCHER, J.
1963, 2009
BLACK, J.
2078
BLAGOSLOVENSKY, G.S.
2403
BLAKE, R.K.
1967*
BLANCO, M.F.
1900*
BLASKOVITS, A.
1952, 1957
BLAVON-DUCHESNE, N.
2578
BLENDIS, L.M.
2154
BLINKOV, I.L.
2429
BLOCH, F.
2265
BLOCH, P.
1951, 2284
BLOCK, G.E.
1815*
BLONDET, R.
2610
BLOOM, S.R.
1774, 1791, 1868
BLOTNA-FILIPIAK, M.
1955
BLOXAM, D.L.
1926
BLUESTONE, C.D.
2060*
BLUM, A.L.
2070*
BLUMENFELD, T.A.
1905*
BLUMGART, L.H.
2013, 2514
BOBIN, J.Y.
2610
BOBKOV, J.G.
2586
BOCHENEK, W.J.
1941, 1942
BOCKEL, R.
2455
BODEMAR, G.
2174, 2176, 2177
BOGACHIK, L.I.
2383
BOGATIR'OVA, S.O.
2377
BOGOYAVLENSKY, V.F.
2585
BOHAN, A.
2334*
BOHMAN, T.
1990
BOHMER, R.
2554
BOISSIERE, H.
2556
BOISSON, J.
2169*
BOIVIEUX, J.F.
1933
BOJANOWICZ, K.
2254
BOJAR, H.
1879*
BOKOVOY, A.G.
2390
BOLONDI, L.
2039
BOLT, M.G.
2472*
BONMELAER, G.
1869
BOND, J.H.
2218
BONDARENKO, M.P.
2379
BONDONNY, J.M.
2250
BONE, D.
1999*
BONE, G.
2249
BONNET-EYMARD, J.
2169*
BONNEVIE, O.
2173*, 2178
BONOLDI, M.C.
2319
BOOLSEN, S.W.
1871
BOOTELLO, A.
1900*
BORDALO, O.
2310, 2318
BORGES, M.A.G.
2346
BORISOV, V.A.
2567
BORJESSON, B.
2451
BOSCHAT, M.
1961
BOSCHETTI, N.C.
2037
BOSCO, F.
2535
BOSRON, W.F.
1894*
BOSS, J.H.
1897*
BOTTO, C.
2025
BOUCHIER, I.A.D.
2512, 2522
BOUMA, M.E.
1949
BOUREAU, M.
2441
BOUREE, P.
2619
BOURKE, J.B.
2317, 2323
BOUVIER, J.B.
2619
BOYCE, H.W., JR.
2092
BOYD, D.I.
1984*
BOYER, J.L.
2472*
BOYER, T.D.
2424
BRACQ, H.
2279
BRADFORD, J.C.
1836
BRADLEY, E.L., III
2002*
BRADY, P.G.
2111*
BRAGANZA, J.M.
2321
BRAIKOW, N.
2462
BRAILSKI, C.
2462, 2463
BRAND, D.L.
2086
BRANDSBORG, M.
1806*, 2158
BRANDSBORG, O.
1806*, 2158
BRANDSTATTER, G.
2278
BRANDTZAEG, P.
1989
BRATANOVA, N.N.
2153
BRATTSTEN, L.
1956
BRAULT, J.
2580
BREAM, C.A.
2082
BREITENFELD, V.
2590
BREMER, A.
1824

BRENNAN, L.A.
2605
BREUER, R.I.
1840
BRIARD, M.L.
2284
BROBMANN, G.F.
2211
BROCHERIOU, C.
2595
BRON, B.
2335*
BROOKS, F.P.
1829
BROOR, S.L.
1731
BROWN, J.M.
1919
BROWN, M.
1794*
BROWN, W.R.
1719*
BROWNE, R.A.
1984*
BROWNING, J.G.
1706*
BROZMAN, M.
1816
BRUCKNER, R.
2262
BRUETON, M.J.
1970
BRUGMANN, E.
2603
BRUNNER, H.
2262, 2458
BRUNS, D.
2104
BRUUSGAARD, A.
2221
BSTEH, O.
2116
BUCCIARELLI, G.
2450
BUCH, A.
2314
BUCH, J.
2314
BUCHANAN, K.B.
2197
BUCHANAN, K.D.
1870, 2170*, 2196
BUCHWALD, H.
2218
BUENO, L.
1753*
BULL, U.
2042
BULLIN, C.H.
2612
BULYCHEV, V.V.
2584
BUNCE, K.T.
1804*
BUNDY, B.M.
2433*
BUONOCORE, E.
2014
BURBIGE, E.J.
2225*
BURGER, K.
2447, 2456
BURK, R.F.
1886*
BURKHARDT, F.
2575
BURKS, T.F.
1752*
BURNS, G.P.
2238*
BURRINGTON, J.D.
2059*
BUSACHI, C.A.
2524
BUSSOLATI, G.
1698*
BUTENKO, O.F.
2373
BUTLER, D.G.
1697*
BUTVIN, G.K.
2142
BUYSE, N.
2277
CABAN, M.
2029, 2425
CABRERA, R.
2025
CAGOSSI, M.
2337
CALABRI, G.
2407
CALDWELL, J.H.
1777
CALL, D.L.
2082
CALUZZI, F.
2137
CAMBIER, P.H.
2213
CAMILLERI, J.P.
2265
CAMP, R.C.
2062*
CANESE, M.G.
1698*
CANTEY, J.R.
1967*
CANUTO, R.A.
1944
CAPELA FERNANDEZ, I.
2133
CAPLIVSKI, G.
2058
CARDILLO, L.
2626
CAREY, M.C.
1881*
CARLSON, G.M.
1757*
CARMICHAEL, F.J.
1950
CARMICHAEL, H.A.
2544*
CARNEIRO CHAVES, F.J.Z.
2615*
CARNEIRO, M.M.S.
2346
CARPIO, N.
2363
CARRATU, R.
2194
CARTER, D.C.
1844
CARTER, E.A.
2422
CARTER-SU, C.
1716*
CARULLI, N.
2535
CASTELEYN, P.P.
1803*
CASTRO, G.A.
1973, 2217
CATFORD, J.
2490
CAULET, P.
2277
CAULIN, C.
2443
CAZIN, A.
2619
CELERIER, M.
2309
CELESTIN, L.R.
2198
CELIBERTI, A.
2450
CELIER, C.
1939
CERDA, J.J.
1974
CEREDA, U.G.
2136
CERUZZI, O.
2025
CHAMLIAN, A.
2439
CHAMONE, D. A.F.
2010
CHAMPAGNE, H.
2277
CHAN, P.K.W.
2517
CHAN, S.V.
1700
CHANG, D.C.
1728*
CHANG, K.H.Y.
1909*
CHAPEL, H.M.
2195
CHAPLIGINA, G.V.
2381
CHARIOT, J.
1873
CHARTRAND, L.
1736
CHASTEL, C.
2618
CHATTOPADHYAY, D.K.
1751*
CHAUVIRE, F.
2438

CHAVEZ-PEON, F.
1741
CHAYVIALLE, J.A.
1869
CHELI, R.
2127
CHEMODANOV, V.I.
2259
CHEN, J.S.
2488, 2489
CHEONG, E.L.
2484
CHEREDNICHENKO, T.V.
2381
CHERET, A.M.
1798*
CHERNYSHEVA, N.A.
2576
CHESKIN, H.
1905*
CHEVALLIER, P.
2393
CHEY, W.Y.
1859*
CHIBA, T.
2469*
CHIBBARO, G.
2396
CHING, B.K.F.
1893*
CHISTOVA, M.A.
2144
CHKAIDZE, O.V.
1916
CHORVATHOVA, V.
2119
CHOWDHURY, A.R.
1759*
CHRISTENSEN, J.
1701, 1746*, 1747*, 1758*
CHRISTIANSEN, J.
2172*, 2180
CHRISTIANSEN, P.M.
2188
CHRISTOPHE, J.
1945
CHUMAK, D.A.
2497
CHUNG, R.S.K.
1982
CIANCAMERLA, G.
2127
CIESZKOWSKI, M.
1802*, 1867
CIOCCA, M.
2037
CLARK, M.L.
1711*, 2223*
CLASSEN, M.
2530, 2531
CLAVADETSCHER, P.
2286
CLEARFIELD, H.R.
1859*
CLEATOR, I.G.M.
2216
CLEMANS, S.D.
1836
CLEMETT, A.R.
2477, 2478
CLINTON, S.K.
1891*
COCCHI, P.
2574
COCCHIERI, G.
2626
CODY, H.S., III
2159
COHEN, M.I.
2368
COHEN, S.
1757*, 1772*
COLLIS, J.L.
2069*, 2078
COLON, J.
2610
COMBES, J.C.
2302*
COMBS, R.C.
2185
CONKLIN, R.
2543*
CONLON, J.M.
1870
CONN, H.O.
2007
CONSOLARO, G.
2228
CONTI, M.
2039
CONTRERAS, M.
2026
COOK, J.D.
1729
COOPER, C.W.
1822
COOPER, J.D.
2068*
COOPER, M.
2298*
COPELAND, E.M.
1973
CORCINO, J.J.
2224*
CORDERO FERNANDEZ, M.C.
2258
CORNET, A.
2169*. 2599
CORREIA, M.A.
1886*
CORTESI, N.
2360
COSTA, P.L.
1852*
COUMAROS, D.
2455
COURSAGET, P.
2397, 2398
COWAN, G.O.
2289*
COX, T.M.
1733, 1734
COY, D.H.
1810*
CRADDOCK, G.N.
1906*
CRAPP, A.R.
2604
CRAWFORD, D.G.
2081
CRAWSHAW, S.J.
1740
CREAN, G.P.
2197
CREMER, M.
2502
CREUTZFELDT, W.
1856*
CROTTE, C.
1929
CROZIER, R.E.
2073*
CRUZ, I.
2615*
CRYER, P.E.
2412*
CUBILLA, A.
2306*
CURRIER, B.
2218
CURSCHMANN, D.
2463
CZECHLOWSKI, B.
2267
CZLONSKOWSKA, A.
2358
CZYGAN, P.
1914, 2493, 2536
DAEMS, W.T.
2213
DAFELDECKER, W.P.
1894*
DAGRADI, A.E.
2185
DAJANI, E.Z.
1796*
DALTON, M.D.
2062*
DALY, J.M.
2217
DAMGAARD, S.E.
1895*
DANIEL, E.E.
1749*, 1767*
DANIELIAN, G.A.
2261
DAS, K.M.
2289*
DAUBRICOURT, M.
2123
DAUCHEL, J.
2455
DAUM, F.
2368
DAVIDSON, G.P.
1697*
DAVIDSON, J.F.
2367
DAVIS, M.G.
1740
DAWSON, A.M.
1711*
DAYAL, Y.
1797*
DE ANGELIS, R.C.
1722*

DE CANDIA, O.
2427
DE CECCO, A.
2396
DE FLORIO, L.
2593
DE LA MAZA, D.
2026
DE LA SANTA LOPEZ, J.
2258
DE LUCA, L.
1911
DE MAGISTRIS, L.
2194
DE MARTINO, M.
2407
DE PEYER, E.
2614
DE RIDDER, A.L.A.
1780
DE SCHRYVER-KECSKEMETI, K.
1799*
DE TOEUF, J.
2502
DE TROYER, A.
2444
DEAK, S.
1730
DEBAS, H.T.
1766*
DEBRAY, C.
1873
DEERING, T.B.
2164*
DEGOS, J.D.
2349
DEIMER, E.
2350
DEKABAN, A.S.
2608
DEKKER, W.
1994*
DEL FAVERO, C.
2137
DEL SOLAR, J.A.
2036
DELELLIS, R.A.
1797*
DELEZE, G.
1920
DELGADO BRAVO, V.
2133
DELLE FAVE, G.F.
2194
DELMONT, J.
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DELORME, M.L.
1961
DELUCA, H.F.
1721*
DEMANET, J.C.
2444
DEMEESTER, T.R.
2059*
DENBESTEN, L.
1982
DENNISS, A.R.
1743
DEODHAR, S.D.
2058
DEPEW, W.T.
2424
DEREVYANKO, V.P.
2587
DESCOS, L.
2625
DESMET, V.J.
2372*, 2524
DEVAUX, M.A.
1878
DEVROEDE, G.
1756*, 2294
DEYHLE, P.
2286
DI FEBO, G.
1817
DIASAMIDZE, Z.I.
2022
DIEMER, N.H.
1908*
DIENSTAG, J.L.
2422
DIEZ, S.
1840
DIJKHOF, J.
1863*
DILAWARI, J.B.
2154
DILEEPAN, K.N.
1904*
DIMAGNO, E.P.
1775, 1864*, 2305*, 2605
DINOSO, V.P., JR.
1859*
DINSTL, K.
2077
DIOGUARDI, N.
2410
DIWOK, K.
2462, 2463
DJAHANGUIRI, B.
1792*
DOBBINS, W.O., III
2291*
DOBRILLA, G.
2319
DOBRONRAVOV, D.S.
2500
DOBRZANSKA, M.
1802*
DOCIMO, R.
2280
DODD, G.D.
2052
DODDS, W.J.
1746*, 1776
DOFFOEL, M.
2455
DOHERTY, C.C.
2170*, 2196
DOIZAKI, W.M.
2432*
DOLLE, W.
2146
DOMINGUES, W.
2615*
DOMINGUEZ MILINER, A.
2258
DOMRES, B.
2348
DOMSCHKE, S.
1774, 1791
DOMSCHKE, W.
1754*, 1774, 1791, 1979, 2307
DONATI, C.
2410
DONNER, M.W.
2056
DONOVAN, I.A.
2069*, 2183, 2200
DOPPELFELD, E.
2027
DORAN, J.
1935, 2511
DORCHE, J.
2440
DORFLINGER, B.
2035
DORRICOTT, N.J.
2518
DORSCH, E.R.
2065*
DOSKOVA, M.
2459
DOWLING, R.H.
1935, 2513, 2515
DOZOIS, R.R.
1775, 1864*
DREILING, D.
2318
DREILING, D.A.
2310
DREYFURST, R.
1879*
DREYFUSS, F.
1760*
DRILL, V.A.
2332*
DRISKILL, D.R.
1796*
DRUART, F.
2578
DRUCKER, J.
2397, 2398
DRYBURGH, J.R.
1766*
DRYSZKA, H.
1928
DUANE, W.C.
1778
DUBARRY, J.J.
2285
DUBOIS, A.
1807*
DUBOIS, R.S.
1919
DUBRASQUET, M.
1803*, 1809*
DUDRICK, S.J.
1973, 2217
DUGDALE, L.M.
2004

DUHAMEL, J.F.
2563, 2628
DUJOVNE, C.A.
1921
DUMANS'KII, I.I.
2387
DUMAS, D.J.
1836
DUMITRESCU, D.
1915
DUMONT, F.
1985*
DUMONT, M.
1882*
DUNCAN, C.L.
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DUNCAN, J.G.
2514
DUPONT, H.L.
2543*
DUTTA, S.K.
2089
DVORAKOVA, H.
2033
DZWONKOWSKI, S.
2496
EASTWOOD, G.L.
1694*, 2087
EASTWOOD, M.A.
2289*
ECHENIQUE ELIZONDO, M.
2122
ECKARDT, V.F.
2075
EDER, E.
2243
EDKINS, S.M.
1970
EDMONDS, C.J.
2435*
EDY, V.G.
2413*
EECKELS, R.
2227
EFSEN, F.
2214
EGGERMONT, E.
2227
EGGERT, A.
2510
EGOROV, T.L.
2587
EICHER, E.M.
1721*
EIDE, T.J.
2264
ELEWAUT, A.
2268
ELGHOZI, L.
2256
ELIAS, E.
2311*
ELLERT-ZYGADLOWSKA, J.
2365*
ELLIS, D.J.
2192
ELLIS, F.H., JR.
2073*
ELMSLIE, R.G.
1975
ELSBORG, L.
2158
ELSTER, K.
2003*
EMAS, S.
1790, 1809*
ENCKE, A.
2493
ENGEL, C.
2145
ENGSTROM, J.F.
2106
ERBE, W.
2501
ERICSSON, C.
2543*
ERIKSSON, H.
1883*
ERIKSSON, S.
2431*
ERLINGER, S.
1882*
ERMOLENKO, Z.N.
2576
EROPKIN, P.V.
2260
ESCRIBANO, J.C.
2339
ESPIRITU, C.R.
2369
ESTANY GOLANO, L.
2624
ESTELLER, A.
1855*
ESTEVE, J.P.
1869
ETHEREDGE, E.E.
2241*
EVANS, N.
2597
EYSKENS, E.
2551
FABRIS, G.
2596
FAGUNDES NETO, U.
2525, 2526
FAHRENKRUG, J.
1871
FAIRCLOUGH, P.D.
1711*, 2223*
FALCHERO, F.
2140
FALKENSTEIN, D.B.
2478
FARACK, P.
2458
FARMAN, J.
2204*
FARRET, O.
2557
FARRIAUX, J.P.
2613
FAVA-DE-MORAES, F.
1788*
FAYADH, M.
1935
FEDOROV, V.D.
2263
FEDOROWSKI, T.
1928
FEKETY, F.R.
2240*
FEKETY, R., JR.
1984*
FELDER, M.
2319
FELDMAN, E.B.
1923
FELSHER, B.
2363
FENGLER-DOPP, D.
2621
FENGLER, J.D.
2336
FENWICK, J.
2006
FEO, F.
1944
FERGUSON, A.
2600
FERNANDEZ-CRUZ, E.
1900*
FERNHOLZ, H.J.
2027
FERRUCCI, J.T., JR.
2015
FEURLE, G.E.
2168*
FEVERY, J.
1913
FIASSE, R.
2601
FICCA, J.F., JR.
2485
FICHTNER, I.
2589
FIEHRING, C.
2609
FIERSTEIN, J.T.
1744*
FIESSINGER, J.N.
2265
FIGUEROA, C.H.L.
2037
FILIPPINI, M.
2319
FISCHEL, B.
1760*
FISCHER, J.E.
1960, 2422
FISHER, M.M.
1926, 1931, 1932
FLACH, A.
2271
FLANAGAN, P.R.
1965*
FLEMING, J.
2597
FOLIOT, A.
1939
FOLSCH, U.R.
1856*
FONTAINE, J.L.
2564

FONTANA, G.
1852*
FONTANA, I.
2360
FORCHE, G.
2509
FORELL, M.M.
1872, 2020
FORSTER, H.
1951
FORSTNER, G.
1971
FORSTNER, G.G.
1965*
FORTNER, J.G.
2306*, 2486
FOSTER, D.N.
2190
FOUQUET
2619
FOZ, M.
2339
FRANK, D.M.
1987
FRANSSON, L.
2174, 2177
FRANZINI, P.
2136
FRATALOCCHI, A.
2534
FREI, E.H.
1760*
FRELEK, M.
2118
FRENEAUX, B.
2277
FRESNEDA MORENO, V.
2133
FRESTON, J.
2088
FREYSZ, M.
2560
FREZAL, J.
2284
FRIGERIO, G.
2470*
FRITSCH, W.P.
1821
FROHLING, W.
1914, 2493
FROLKIS, A.V.
2270
FUCHS, F.
1879*
FUCHS, H.F.
2018
FUJITA, N.
1865*
FUKUDA, H.
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FUNATSU, K.
1931
FURSOVA, D.G.
2375
FUSAMOTO, H.
1703
FUTAGAWA, S.
2074*
GABRIEL, L.
1944
GABRIELLI, M.
2396
GABRYELEWICZ, A.
1771*
GABUNIYA, R.I.
2162
GADZHIEV, K.E.
2134
GAGNOLET, R.
2409
GALAGUZA, U.P.
2579
GALAMBOS, J.T.
2002*
GALDABINI, J.
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GALIAN, A.
2293
GALITSKY, A.B.
2500
GALIYANOVA, G.A.
2558
GALL, D.G.
1697*
GALLAGHER, N.D.
1742
GALLO, L.L.
1714*
GALPERIN, E.I.
2359, 2587
GALSTIAN, A.M.
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GARCEA, R.
1944
GARCIA, C.R.
2332*
GARCIA OCANA, A.
2355
GARDINER, G.A.
2296
GARDNER, J.D.
1857*, 1858*
GARNACHO, A.
2339
GARTNER, L.M.
2481
GARZA-GARZA, R.
2241*
GASMAEV, V.K.
2207*
GASPARINI, G.
2032
GASSULL, M.A.
2154
GASTAMINZA GOICOECHEA, R.
2122
GEENEN, J.E.
1776
GEFFERTH, G.
1957
GELRUD, L.G.
1927
GENDRE, J.P.
2553, 2625
GENIN, R.
2560
GEPTS, M.
1824
GERARD, J.
1756*
GERARD, J.P.
2610
GERASIMENKO, N.S.
2387
GERAYESH-NEJAD, S.
1792*
GERBER, H.
2613, 2614
GERBER, M.A.
2423
GERHARD, W.
2342
GEROLAMI, A.
1929
GHAHREMANI, G.G.
2204*
GHERARDI, M.C.
2360
GHETTI, A.
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GHIDINI, G.
2360
GHIGI, G.
2593
GIARDINA, P.
2331*
GIBB, S.P.
2008
GIBINSKI, K.
2171*
GIBODA, M.
2622
GIETKO, M.
2118
GILAT, T.
1760*
GILL, S.S.
2068*
GILLBERG, R.
1996*
GILLOT, F.
2282
GINSBERG, A.L.
2291*
GINSEL, L.A.
2213
GIRARD, M.
2440, 2455
GIRARDET, J.P.
2564
GIRVAN, D.P.
2193
GLANZ, I.
2095
GLANZMAN, S.L.
2305*
GLASINOVIC, J.C.
1882*, 1933
GLAZER, G.
1875
GLOOR, F.
2286
GO, K.
1872

GO, V.L.W.
1775, 1864*, 2164*, 2305*, 2605
GODDARD, J.
1762*
GOFFRINI, P.A.
2448
GOLD, B.M.
2161
GOLDMAN, M.L.
2002*
GOLDROSEN, M.H.
2238*
GOLDSTEIN, F.
2297*
GOLDSTEIN, H.M.
2052
GOLDSTEIN, L.I.
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GOLIANA, V.I.
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GOLINDANO, C.
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GOLLAN, J.L.
1936
GOLLER, W.
2352
GOLOVANOVA, L.V.
2403
GOLTERMANN, N.
1808*
GOLZAND, I.V.
2403
GOMES, C.
2615*
GOMEZ-PAN, A.
1810*
GONDAY, G.
2557
GONZALEZ GONZALEZ, M.
2122
GOODALL, J.S.
2076
GOODWIN, C.
2085
GORBACHEVA, A.I.
2566, 2571
GORDON, J.
2332*
GORETZLEHNER, G.
2603
GORSKA, D.
2358
GORSKA, M.
2267
GOSALVEZ, M.
1900*
GOSZCZYNSKI, K.
2118
GOTO, R.
1850*
GOTO, Y.
1843
GOUDEAU, A.
2397, 2398
GOULLE, J.P.
1915
GOURLAY, R.H.
2216
GOYAL, R.K.
2062*
GOYANES-VILLAESCUSA, V.J.
2364
GRACCO, G.
2596
GRAHAM, D.Y.
2065*
GRAHAM, G.G.
1726*
GRAND, R.J.
2287*
GRASSO, P.
1898
GREANEY, M.G.
1751*
GREEN, W.E.R.
1754*
GREENBERG, G.R.
1868
GREENBERG, L.
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GREGG, J.A.
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GREGORY, A.
2521
GREGORY, D.H.
1925, 1927
GREIDER, M.H.
1799*
GREIF, S.
2509
GREILING, H.
1899*
GREIM, H.
1884*, 1885*
GRENIER, J.F.
1866
GRESSNER, A.M.
1899*
GREVSTEN, S.
2210
GRIFFEN, W.O., JR.
2205*
GRIFFIN, D.W.
2069*
GRIGOREVSKY, V.P.
2023
GRIGORIAN, G.T.
2261
GRIMES, D.S.
1762*
GRISCELLI, C.
2555
GROSBERG, S.J.
2473*
GROSS, R.
2083
GROSSMAN, M.I.
1830, 1844
GROTZINGER, U.
2167*, 2215
GROUFSKY, A.K.
1959
GRUENAGEL, H.H.
2348
GRUNEBAUM, M.
2095
GRUTTE, F.K.
1718*
GUBERGRITS, A.Y.
2591
GUDMAND-HOYER, E.
2233
GUELLER, R.
1779
GUGIC, F.
2590
GUILBERT, F.
2595
GUILLEMIN, R.C.
1977
GULACSIK, C.
1827
GULBIS, A.
2502
GULLO, L.
1852*, 2315
GUMUCIO, J.J.
1922
GUNTHER, M.
2458
GUPTA, C.D.
1699*
GUPTA, S.C.
1699*
GURAN, P.
2441
GUREEVA, K.F.
2260, 2276
GUSTAFSON, A.
2480
GUZZON, A.
2032
GYR, K.
2320
HABER, I.
2049
HACKI, W.H.
1795*, 2320
HADDAD, A.
1788*
HADORN, B.
2234
HAFKENSCHEID, J.C.M.
2550*
HAGENMULLER, F.
2531
HAGGITH, J.W.
2006
HAIDERER, O.
2184
HALDY, P.
2286
HALL, A.W.
1815*
HALL, T.J.
2298*
HALLER, J.A.
2061*
HALLORAN, L.G.
1925

HALME, H.
2329*
HALTER, F.
1795*
HAMELMANN, H.
2143
HAMER, J.D.
2192
HAMILTON, J.R.
1697*
HAMILTON, S.G.L.
1768*
HAMMER, B.
2286
HANCK, A.
1940
HANIK, L.
2431*
HANNUKSELA, M.
2329*
HANSEN, D.G.
1830
HANSEN, H.J.B.
2214
HANSON, W.R.
1695*
HARDCASTLE, J.
1706*
HARDCASTLE, P.T.
1706*
HARDING, L.K.
2069*
HARDOUIN, J.P.
2257
HARMON, J.W.
1828
HARPER, A.A.
1870
HARRIES, J.T.
2232
HARTMANN, F.
2421
HARVEY, R.F.
1874
HASHIMOTO, H.
2275
HASIBA, U.W.
2330*
HATCHER, C.R.
2094
HATFIELD, A.R.W.
2046
HAUN, C.L.
2094
HAUSAMEN, T.U.
1821
HAVLIK, J.
2034
HAYASHI, S.
2434*
HAYS, D.M.
1907*
HAYWARD, R.
2249
HAZLEWOOD, C.F.
1728*
HEARNS, J.B.
2197
HEBRERO SAMMARTIN, J.
2355
HEGARTY, M.M.
2063*
HEHUNSTRE, J.P.
2250
HEIJTINK, R.A.
2413*
HEIMANN, R.
2372*, 2601
HEINE, H.
2589
HEINE, W.
1718*
HEINZE, H.G.
2042
HEIT, H.A.
2092
HELANDER, H.F.
1790
HENDEL, L.
1837
HENDERSON, G.
1732
HENDERSON, R.D.
2064*
HENDRICKS, J.C.
1775
HENDY, R.
1898*
HENIN, D.
2457
HENRIKSEN, F.W.
1837
HERBST, J.J.
2088, 2103
HERMANUS, A.
2502
HERMOS, J.A.
2087
HERMRECK, A.S.
2081
HERRERIAS, J.M.
2494
HESSELDAHL, H.
1837
HIDALGO PASCUAL, M.
2355
HIEBERT, C.A.
?101
HIGGINS, G.A., JR.
2152
HILDEBRAND, E.
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HILGARTNER, M.W.
2331*
HILL, J.L.
2059*
HILL, L.D.
2098
HILPERT, H.
2613, 2614
HIMAL, H.S.
1707*, 1713*
HINDER, R.A.
1761*
HINE, P.
2532
HINO, K.
2275
HIPPE, E.
2547*
HIRAMATSU, K.
1703
HIRSCH, J.F.
2599
HIRSCHOWITZ, B.I.
1813*
HIRT, H.J.
2255
HIRTE, C.
2343
HJELT, K.
2547*
HO, K.J.
2488, 2489
HOARE, A.M.
2195, 2200
HOBSLEY, M.
1819
HOCHLEITNER, F.
2594
HODGSON, H.J.F.
2292*
HOENSCH, H.
2421
HOFMANN, A.F.
2588
HOGAN, W.J.
1776
HOHENAUER, L.
2559
HOLDEN, R.J.
2197
HOLDER, T.M.
2085
HOLDSWORTH, C.D.
1717*, 2516
HOLIK, F.
2034
HOLLAND, R.K.
1959
HOLM, H.A.
1835
HOLMES, R.
1735
HOLSCHNEIDER, A.M.
2251
HOLST, J.
2300*
HOLTEMULLER, K.H.
2536
HOLYOKE, E.D.
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HONMA, T.
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HOMMES, F.A.
1954
HONEGGER, J.
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HONIGSMANN, H.
1917
HONJO, I.
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HOOD, A.J.C.
1870
HOOS, I.
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HOPKINS, J.
1733
HOPPE, U.
2348
HORBACH, L.
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HORI, R.
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HORNIG, D.
1940
HORNOWSKI, S.
2496
HORSTMANN, H.J.
2607
HOSAKA, H.
2539
HOST, V.
1806*
HOSTRUP, H.
2182
HOUNSFIELD, G.N.
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HOUSSET, E.
1939
HOWANIETZ, L.
2350
HOWARD, E.R.
2520
HOYUMPA, A.M., JR.
1723*, 1732
HRUSKA, K.
2241*
HSU, S.C.
2488, 2489
HSU, W.H.
1822
HUBENS, H.
2049
HUCHZERMEYER, H.
2109, 2495
HUGHES, R.G.
2298*
HULSE, E.V.
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HUNT, P.S.
2288*
HURWITZ, S.
1710*
HUSBAND, J.E.
2001*
HUTCHISON, G.A.
1813*
HYUN, J.
1714*
IAVARONE, A.
2030
IDEO, G.
2410
IGNACZAK, L.
2505
IIDA, M.
2246
IKONNIKOV, A.I.
2162
ILLANICZ, B.
2131
IMRIE, C.W.
2514
IMRIE, M.J.
2076
INFANTE, R.
1949
INGEMANSSON, S.
2300*
INOKUCHI, K.
2151
INUI, K.I.
1727*
IOF, I.M.
2148
IPPOLITI, A.F.
2201*
IRVIN, T.T.
1751*
ISENBERG, J.I.
2201*
ISER, J.H.
2513
ISOBE, K.
1719*
ISRAEL, Y.
1950
ISSELBACHER, K.J.
2422
ISWARA, K.
2016
ITIN, A.B.
2308
ITO, S.
1851*
ITOH, T.
2112*
ITOH, Z.
1765*
IVANOV, Y.I.
1739
IVARSSON, S.
2480
IWAMA, T.
2247
IWANAGA, T.
2112*
IWATSUKI, N.
1877
IZABEKOV, Z.B.
1700
IZIMBERGENOV, N.I.
2338
JABLONSKA-KASZEWSKA, I.
2267
JABLONSKA, M.
2459
JACKSON, B.T.
2519
JACOBS, E.
2601
JACOBS, W.H.
2104
JACOBSON, E.D.
1983*
JACOBSSON, S.I.
2096
JAFFE, B.M.
2199
JAKO, J.
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JAMES, J.H.
1960
JAMES, O.
2006
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2621
JAPARIDZE, T.N.
1916
JARVINEN, P.
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JASIEL, M.
2365*
JASKA, F.
2181
JATZKO, G.
2184
JAVETT, S.
2295
JAWOREK, J.
1867
JAWORSKI, R.
2504
JEAN, F.
1939
JEAN-LOUIS, P.
2409
JEDRZEJCZYK, W.
2508
JEHN, D.
1907*
JELLINEK, M.
1800*
JENKINS, D.J.A.
2154
JESEL, B.
2357
JEWELL, D.P.
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JEZDIC, M.
2024
JIRASEK, V.
2033
JODAL, M.
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JODYNIS, J.
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JOFFE, S.N.
2514
JOHANSEN, A.
2057
JOHNSON, G.M.
1982
JOHNSON, L.F.
2083, 2092
JOHNSTON, D.G.
2420
JONAS, A.
1965*, 1971
JONES, E.A.
2433*, 2616*
JORDAN, P.
1997*

JOS, J.
2229
JOUN, N.S.
1893*
JULER, G.L.
2185
JULIEN, M.
2625
KABOTH, U.
2316
KACHURIN, V.S.
2507
KADELL, B.M.
2475*
KADIROV, B.A.
2374
KAGA, Y.
2275
KAHN, A.
2005
KAHN, M.F.
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KAISER, G.
1782
KAKIS, G.
1932
KALAB, M.
2354
KALANT, H.
1950
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2552
KALIMA, T.
2248
KALINO, H.
2186
KALLOOR, G.J.
2078
KALLUM, B.O.
2486
KAMADA, T.
1703
KAMINSKI, D.L.
1800*
KAMINSKI, R.J.
2083
KANAZAWA, G.
2275
KANAZAWA, K.
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KAPPAS, A.
2518
KAPPUS, H.
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KARAGYULYAN, S.R.
2359
KARASAWA, T.
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KARASKOVA, B.
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KARLAGANIS, G.
1920
KASAI, M.
2105
KASATKIN, Y.N.
2022
KASWIN, R.
2309
KATHER, H.
1845
KATS, S.A.
2497
KATSUNUMA, T.
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KAUFMAN, B.
2047
KAUTZ, G.
2523
KAVKALO, N.N.
2142
KAY, G.
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KAY, J.M.
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KAY, L.A.
1960
KAY, S.
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KAYASSEH, L.
2320
KAYE, M.D.
2072*
KEDSIORA, J.
2477
KEEHN, J.
2152
KEIGHLEY, M.R.B.
2069*, 2511, 2518, 2604
KEITEL, R.
1912
KELLEY K.A.
1761*
KELLY, G.A.
1860*
KEMPF, P.
2262
KENT, S.J.S.
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KESANIEMI, Y.A.
2415
KHABIDULINA, L.A.
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KHAKHANOVA, M.V.
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KHANNA, J.M.
1950
KHAZANOV, A.I.
2436
KHROMENKOV, V.I.
2022
KIHL, B.O.
1838
KIM, D.K.
2306*, 2486
KIMMICH, G.A.
1716*
KIMURA, K.
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KIMURA, T.
2105
KIRCH, W.
2607
KIRSH, M.M.
2079
KISHKO, A.M.
2376
KISS, M.M.B.
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KISS, T.
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KISSANE, J.M.
2412*
KITA, L.
2508
KIVIRIKKO, K.I.
2414*
KLATSKIN, G.
2371
KLEIN, G.L.
1726*
KLEIN, P.D.
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KLINE, T.S.
2297*
KLIPSTEIN, F.A.
2224*
KLOTZER, B.
1912
KNIERIM, F.
2036
KNOKE, M.
2226
KOBAYASHI, R.
2434*
KOBAYASHI, S.
1851*
KOCH, M.
2249
KOCK, N.G.
2215
KODAMA, K.
2080
KODAMA, Y.
2151
KODLOVA, E.
2034
KODSI, B.
2016
KOEHLER, R.E.
2054
KOENIGSBERGER, M.R.
1905*
KOEPPE, P.
2035
KOHLER, H.
2607
KOLARSKI, W.
2345
KOLASSA, N.
1709*
KOLESNIKOVA, A.F.
2566, 2571
KOLHOUSE, J.F.
1715*
KOLODEJ, A.
1763*
KOLTS, B.E.
1838
KOLYCEVA, N.I.
1700
KOMMERELL, B.
2493, 2536
KONTUREK, S.J.
1801*, 1802*, 1825, 1867

KOOP, H.
2312, 2316
KORDAC, V.
2354
KORNOTZKI, M.
2589
KOROLEV, V.I.
2359
KORPASHVILI, K.I.
1916
KOSAKA, K.
2434*
KOSSAK, J.
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KOSTA, L.
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KOSUBA, R.B.
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KOUNTZ, S.L.
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KOVACS, E.
2131
KOVALEV, M.M.
2573
KOVBASIUK, G.D.
2129
KOWALEWSKI, K.
1763*
KOZAKIEWICZ, H.
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KRADINOV, A.I.
2114
KRAFT-KINZ, J.
2115
KRAG, E.
2221
KRASIK, E.L.
2558
KRASILNIKOFF, P.A.
2233
KRATOCHVIL, P.
2278, 2509
KRATZSCH, K.H.
2465
KRAUSE, F.
2141
KRAVCHENKO, I.A.
2376
KREEL, L.
2001*, 2017
KREJS, G.J.
2070*
KRISHNAN, C.
1971
KRIVORUCHKO, B.I.
1918
KRON, K.A.
1922
KRONBERG, O.
2188, 2189
KRONBERGER, L.
2115
KRUSE, A.
2483
KUBICOVA, E.
2622
KUDLA, A.A.
2497
KUHN, C., III
2412*
KUIJTEN, R.H.
1780
KUMAR, M.S.
2058
KUNNEN, M.
2268
KUPFER, A.
1963, 2009
KUPKINA, G.K.
2382
KURBANGALEEV, S.M.
2506
KURBANOV, M.K.
2389
KURNOSOVA, N.A.
2576
KUROWSKI, R.
2504
KUSHLAN, M.C.
1943
KUZIN, M.I.
2144
LABBE, F.
2229
LABO, G.
1852*
LAFAIR, J.S.
2548*
LAGARDERE, B.
2564
LAINE, F.
2208
LAITAO VALADARES ROQUETE, M.
2527
LAKE, B.D.
2235*
LAM, S.K.
2517
LAMBERT, M.E.
2191
LAMERS, C.B.H.
2550*
LAMOTTE, M.
2443
LANDER, J.
2412*
LANDOR, J.H.
1838
LANE, H.W.
1974
LANGE, L.G.
1894*
LANGMAN, M.J.S.
2317
LANKISCH, P.G.
2312, 2316
LANZA, F.
2065*
LARGAJOLLI, F.
2427
LARSEN, S.
2048
LARSSON, L.I.
2300*
LASSAUNIERE, J.M.
2560
LAUGIER, R.
1861*
LAUNAY, J.F.
1866
LAVROVA, K.V.
2375
LAWAETZ, O.
2179
LE FRECHE, J.N.
2279
LE MAREC, B.
2279
LE QUINTREC, Y.
2553, 2625
LE ROY, J.P.
2618
LEAO, E.
2527
LEBED', O.P.
2378
LEBEDEV, S.P.
2426
LEBON, J.
2277
LECHNER, K.
2328*
LECLERC, J.P.
2309
LECOMPTE, P.M.
2075
LECOMTE, A.
2553
LEE, D.
1959
LEE, E.
1906*
LEE, K.S.
2481
LEE, Y.T.N.
2333*
LEEDS, A.R.
2154
LEESE, H.J.
1702
LEFEBVRE, D.
1736
LEHMUSKALLIO, E.
2329*
LEIDNER, S.D.
2237*
LEISNER, B.
2042
LEKTORSKY B.I.
2587
LEMAIRE, A.
2399
LEMERLE, J.
2564
LENDER, M.
2606
LENNARD-JONES, J.E.
2290*
LENTINI, S.
2461
LEONARDI, H.K.
2073*

LEONTIEV, A.F.
2442
LESBROS, F.
2625
LESEC, G.
2563
LEUSCHNER, U.
1914
LEVENDJUK, A.M.
1998*
LEVI, A.J.
2046
LEVIN, A.A.
2558
LEVIN, B.
2239*, 2298*
LEVIN, R.J.
1717*
LEVINE, R.A.
2163*
LEVITAN, M.K.
2276
LEVITSKY, N.A.
2497
LEVITT, M.D.
2218
LEVY, A.
2606
LEWICKI, I.
2465
LEWIN, M.J.M.
1798*
LEWIS, C.D.
1828
LEWIS, J.H.
2330*
LI, T.K.
1894*
LIAVAG, I.
2187
LICASTRO, R.
2037
LICHTENBERGER, L.M.
1769*, 1805*
LIEBER, C.S.
1890*
LIERSCH, M.
1914
LILLY, J.R.
2476*
LIMA, J.P.
2528
LIMA, T.G.
1788*
LINARI, G.
2461
LINDQUIST, B.
2598
LINEVSKY, Y.V.
2561
LITWACK, K.D.
2334*
LIVNI, N.
2548*
LIVSTONE, E.M.
2066*, 2242*
LLANOS, O.L.
1801*, 1839
LO MONACO, F.
2280
LOBLEY, R.W.
1735
LOGINOV, A.S.
2445, 2464
LOHLEIN, D.
2117
LOIUDICE, T.
2542*
LOMBARDI, F.
2032
LONG, B.W.
1857*
LONG, R.F.
2046
LONGSTRETH, G.F.
2164*
LOPATKINA, T.N.
2426
LOPEZ DE ROMANA, G.
1726*
LORBER, S.H.
1759*
LORIE, N.Y.
2402
LOSOWSKY, M.S.
2190
LOSSEV, B.
2345
LOTH, R.
2458
LOVGREEN, N.A.
1806*
LOYGUE, J.
2284
LUBCZYNSKA-KOWALSKA, W.
2043
LUBIN, J.
2369
LUGLI, R.
2534
LUI, F.
2016
LUINI, R.
2137
LUIT-DE HAAN, G.
1954
LUKASZYK, A.
1955
LUNDBERG, H.
2480
LUNDERQUIST, A.
2300*
LUNDGREN, O.
1705*
LUNING, M.
2447
LUNZENAUER, K.
2408, 2589
LUSKA, G.
2495
LUTZ, H.
2018
LUX, G.
1774
LUX, J.
2438
LUZ, G.
1791
LYMAR, L.I.
2121
LYNEN, F.K.
1783
MACGLADRIE, K.
1740
MACGREGOR, I.L.
1779
MACHADO, N.
2525, 2526
MACHYTKA, B.
1951
MACIALOWICZ, D.
2118
MACLEAN, W.C., JR.
1726*
MADI, K.
1988
MADURERI, V.
2097
MAGALHAES, A.
2281
MAGNANELLI, A.C.
2010
MAHMOUD, A.A.F.
1987
MAHOUR, G.H.
2206*
MAILMAN, D.
1738
MAINZ, D.L.
1862*
MAKAROVA, K.A.
2023
MAKAROVA, Y.Y.
2499
MAKHARADZE, S.K.
1916
MAKI, T.
1986*
MALAGELADA, J.R.
2000*, 2164*, 2305*
MALAGOLI, M.
2360
MALEEV, A.
2345
MALEEV, V.V.
2584
MALIA, R.G.
2516
MALIUKH, L.S.
2128
MALLINSON, C.N.
1868
MALMENDIER, C.L.
2303*
MALVAUX, P.
2227
MAMCHICH, V.I.
2498
MANCINELLA, A.
2427
MANDELLI, V.
1785

MANEGOLD, B.C.
2110
MANEWSKA, B.
2602
MANIAKO, B.A.
2113
MANN, N.S.
1831, 1832, 1833
MANOILOV, Y.S.
1918
MANSOUR, K.A.
2094
MARANGHI, V.
2353
MARCELLO, U.
2228
MARGOLIS, D.M.
2241*
MARGREITER, R.
2283
MARGULES, E.
1948
MARGULIS, A.R.
2054
MARINOVIC, Y.
1933
MARKIEWICZ, W.
2471*
MARKOV, B.A.
2442
MARKOV, R.M.
2446
MARKS, J.M.
2546*
MARQUES DA SILVA, E.
2615*
MARRYATT, G.
2064*
MARSH, G.F.
1804*
MARSHALL, J.P.
1991
MARTEAU, C.
1929
MARTEN, A.
2311*
MARTI, M.C.
2620
MARTIN, T.R.
2038
MARTINEZ-ALMOYNA, R.C.
2273
MARTINEZ MOLINA, E.
2133
MARTINEZ-VICTORIA, E.
1855*
MASSA, E.
1726*
MASTIUKOVA, I.N.
2401
MASUREL, N.
2413*
MATAR, A.
2595
MATHIEU, B.
2439
MATON, P.N.
2513
MATSUMOTO, Y.
2474*
MATSUSAKA, T.
2151
MATUCHANSKY, C.
2293
MATVEEV, V.I.
2022
MAUDGAL, D.P.
2533
MAUPAS, P.
2397, 2398
MAXIMOVA, E.N.
2113
MAXIMOVICH, N.A.
2565
MAXWELL, V.L.
2201*
MAY, P.S.
1930
MAYER, F.
2362
MAYER, M.
2610
MAYLE, J.E.
1777
MAZZACUVA, D.
2411
MAZZONE, O.
2155
MAZZUCATO, F.
2596
MCCLAIN, C.J.
2419
MCCLOSKEY, D.
2088
MCCLOY, R.F.
1868, 2193
MCCLURE, J.
2600
MCCLURE, J.P.
2160
MCCOLLUM, J.P.K.
2232
MCCORMICK, D.A.
2198
MCDONAGH, A.F.
1936
MCDONEL, J.L.
1966*
MCELHINNEY, J.
2152
MCGEOWN, M.G.
2170*, 2196
MCGUIGAN, J.E.
1799*, 1829, 1838, 1840, 2062*
MCILLMURRAY, M.B.
2317
MCKAY, A.J.
2514
MCKIBBEN, B.
2197
MCNEISH, A.S.
2597
MCSHERRY, C.K.
1930
MEAD, G.M.
2317
MEBIS, J.
2524
MEEK, E.M.
1814*
MEGEVAND, A.
2302*
MEIRE, H.B.
2001*
MEISSNER, H.J.
2627
MELAMED, M.
2050
MELICONI, F.
2574
MELSOM, M.
2048
MENDISOVA, A.
2462
MERKLE, P.
2141
MESSING, B.
2293
METROVELI, C.
2521
METZ, G.
2154
MEYER, J.H.
1779
MEYERS, M.A.
2161, 2204*
MEZY, G.
2250
MICEK, F.
2503
MIES, S.
2010
MIETTINEN, T.A.
2414*, 2415, 2482
MIGLIOLI, M.
1817
MIKA, M.
2425
MIKHAILOV, A.T.
2359
MIKHAILOVA, Z.M.
2405
MIKOS, E.
2171*
MILEV, N.
1823
MILITAREV, I.M.
2263
MILLER, D.G.
2237*
MILLER, D.J.
2371
MILLER, G.
2125
MILLER, L.J.
2605
MILLER, T.A.
1839, 1983*
MILLIGAN, H.P.
2616*
MILLS, D.
1902*
MILOSZEWSKI, K.J.A.
2190

MINIERO, R.
2030
MIRONOV, S.P.
2022
MIRZOIAN, S.A.
2124
MISEVICHUS, I.R.
2147
MISIEWICZ, J.J.
1842
MITCHELL, J.
1840
MITCHELL, S.J.
1791
MITROS, F.
1701
MITZNEGG, P.
1791, 1979
MIYOSHI, A.
1727*
MIZHOROKOVA, Z.
1781
MO, A.
1876
MODIGLIANI, R.
2309
MOE, A.
2048
MOGGI, C.
2407
MOLLA, A.
2227
MOLLARET, H.M.
2580
MONEREO, J.
2273
MONGES, H.
2439
MONTENEGRO, T.S.
2528
MONTI, M.
2326*
MOOSSA, A.R.
1815*, 2298*, 2299*
MORDVINKINA, T.N.
2132
MORENO GONZALEZ, E.
2355
MORETTI-ROJAS, I.
1923
MORETTINI, A.
2396
MORI, M.
1849*
MORI, S.
2105
MORIN, C.L.
2302*
MORISHITA, H.
2080
MORL, F.K.
2272
MORL, M.
2347
MORODER, E.
2319
MOROSINI, S.
2448, 2449
MORSE, E.L.
1712*
MORSON, B.C.
2290*
MOSBACH, E.H.
1928
MOSLEY, J.G.
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MOSLEY, J.W.
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MOTA, J.A.C.
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MOTSON, R.
1948
MOTTA, G.
1911
MOTTET, N.K.
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MOTTIER, D.
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MOULD, A.J.
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MOULE, B.
2013
MOWAT, A.P.
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MRAVAK, S.
2621
MRYGLODOWICZ, A.
2130
MUKHIN, A.S.
2426, 2429
MULE, A.
1929
MULLER-BEUTHOW, W.
1718*
MULLER, D.P.R.
2232
MUNCK, B.G.
1704*
MUNCK, O.
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MUNRO, T.R.
2045
MURILLO, A.
1855*
MURISON, J.
2522
MURPHY, G.M.
1935, 2513
MURPHY, P.R.
1740
MURPHY, R.F.
1870
MURTHY, S.N.S.
1859*
MUSABAEV, I.K.
2570
MUSHENS, J.
1870
MUTING, D.
2452
MYREN, J.
1848, 1990, 2048
MYRKIN, S.D.
2492
MYRVOLD, H.E.
2215
NAGY, B.R.
1926
NAHRWOLD, D.L.
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NAHUM, M.
1911
NAIB, Z.M.
2002*
NAIK, E.
2490
NAKAMURA, N.
1727*
NAKANE, P.K.
1719*
NAKASE, A.
1865*, 2474*
NAKAYAMA, N.
2275
NAKAYAMA, S.
1773*
NALAPKOV, P.N.
2507
NAMIHISA, T.
2370
NAMIKI, A.
1786
NANDI MAJUMDAR, A.P.
1808*
NATELSON, B.H.
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NAUMOVA, M.A.
2581
NAVARRO, J.
2441
NAVASSA, G.
2136
NEAL, H.
2297*
NEDIC, L.
2024
NEEDHAM, T.N.
1875
NEKLYUDOVA, E.A.
2359
NELEMS, J.M.
2068*
NELSON, D.L.
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NELSON, L.M.
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NEWBILL, T.
1714*
NEWCOMBE, R.G.
1814*
NEWMAN, C.L.
2160
NGAN, H.
2517
NICHOLS, B.L.
1728*
NICHOLS, S.G.
1723*, 1732
NICOLADZE, D.
2441

NICOLLE, P.
2580
NICOLSON, M.O.
1907*
NIESSEN, K.H.
2356
NIESSNER, H.
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NIHOUL-FEKETE, C.
2628
NIKITIUK, L.S.
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NIKOLAEV, Y.M.
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NIKOLAEVA, A.A.
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NIKOLOV, N.P.
2153
NILSSON, F.
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NISHIMURA, O.
2080
NISMAN, R.
1925
NIXON, H.H.
2235*
NOMA, K.
2434*
NORDEN, C.
2589
NOREIKA, L.
2147
NORLANDER, B.
2174, 2177
NORLEN, B.J.
2210
NORONHA, M.
2310, 2318
NORTHFIELD, T.C.
2533
NOUEL, O.
2309
NOVIKOFF, A.B.
1849*
NOVOKSHONOV, I.I.
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NOWAK, A.
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NUSSLE, D.
2302*, 2614
NUSSPAUMER, F.
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NUTTER, S.A.
1970
NUVEMANN, M.
2027
O'CONNOR, F.A.
2170*, 2196
O'DOHERTY, P.J.A.
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O'HANLEY, P.D.
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OATES, G.D.
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OBERG, P.A.
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OBIDITSCH-MAYER, I.
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OBRINK, K.J.
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OCKNER, R.K.
1943, 1948
ODA, M.
1931
ODA, T.
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OEN, K.T.
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OESTERLIN, R.
1836
OGATA, T.
2245
OGILVIE, B.M.
1988
OGILVIE, D.
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OGNJANOV, M.
2345
OGURA, J.H.
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OHASHI, E.
1907*
OHKAWA, H.
1764*
OHNISHI, K.
1890*
OHTSUKI, N.
2010
OKADA, N.
2080
OKI, M.
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OKUMURA, K.
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OLAH, A.J.
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OLARTE, J.
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OLBE, L.
2167*
OLIVER, J.M.
2198
OLKOWSKI, L.
2496
OMATA, M.
2424
ONG, G.B.
2517
ONO, K.
1720*, 2537
ONSTAD, G.R.
2038
OPOLON, P.
1961
ORLANDO, R.C.
2082
ORLOFF, M.J.
1977
ORREGO, H.
1950
ORRINGER, M.B.
2067*, 2079
ORTEGA, D.
2339
ORTEGA, J.A.
2097
ORTUNA, G.
2274
ORWIN, J.M.
2076
OSBORNE, J.W.
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OSELKA, G.W.
2346
OSIMANI, J.J.
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OSIPOV, Y.N.
2442
OSORIO, M.
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OSSWALD, P.
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OSTROW, J.D.
1937, 1938
OTTE, M.
2020
OWENS, C.J.
2198
OWENS, D.
2616*
OWYANG, C.
1864*, 2605
PACINI, B.
1719*
PACKER, J.S.
2232
PADMOS, M.
2253
PADULA, A.
2562
PAGLIANI, G.
2039
PAHNKE, L.D.
2306*
PAINVAIN, E.
2353
PALIARD, P.
2409
PALMER, R.H.
1930
PAOLI, J.
2019
PAOLUZI, P.
2194
PAPASOVA, M.
1781
PAPAZIAN, S.A.
2261
PAPP, J.P.
2099
PARGA, L.
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PARKER, D.S.
1969
PARKER, N.H.
2203*
PARKER, T.H.
1991
PARKS, N.M.
1862*
PARONETTO, F.
2416

PARSONS, M.E.
1804*
PASSERON, J.
2619
PASTERNAK, I.I.
2394
PATRICIO, F.R.S.
2525, 2526
PATRICK, G.
1770*
PATRICK, R.S.
2367
PAUL, F.
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PAUMGARTNER, D.
1924
PAUMGARTNER, G.
1920, 1924
PAWLIK, W.
1983*
PAXSON, C.L., JR.
2055
PAZEN, H.
1899*
PEARSON, F.G.
2068*, 2107
PEARSON, J.G.
2249
PECTOR, J.C.
1945
PEDERSEN, L.R.
2221
PEDREIRA, J.
2380
PEIGNOUX, M.
1934
PEIX, J.L.
2123
PELLERIN, F.
1915
PELLEY, R.P.
1997*
PELLICER, J.
2494
PELLIGRINI, C.A.
2059*
PELLISH, L.J.
2087
PENNA, F.J.
2527
PERACCHIA, A.
2448, 2449
PERELLE, B.A.
1960
PEREZ-GUILLERMO, M.
2274
PEREZ, L.
2097
PEREZ MOTA, A.
2355
PERRET, G.
1820
PERRIER, M.
2441
PERSYN, M.J.
2051
PERUZZI, P.
2574
PETERS, T.J.
1733, 1734
PETERSEN, H.
1784
PETERSEN, O.H.
1853*, 1877
PETITE, J.P.
2265
PETRENKO, V.G.
2384
PETRIC, M.
1697*
PETROVA, E.M.
2403
PETROVICHEV, N.N.
2366
PETRUNIN, I.P.
2381, 2390
PETTIROSSI, O.
1986*
PETZOLDT, R.
2018
PFAFF, E.
1884*
PFLUCKE, F.
2071*
PHAT, V.N.
2265
PHILLIPS, J.M.
1950
PHILLIPS, M.J.
1931
PICARDI, C.
2626
PICHLER, E.
2350
PICHLMAYR, R.
2117
PICHOT, J.
2438
PICKERING, L.K.
2543*
PIEPKORN, M.W.
2220
PIEPSZ, A.
2005
PIERCE, J.
2412*
PIETRI, H.
2019
PILLON, M.
2440
PIZAR, G.V.
2383
PLAISIER, H.M.
1695*
PLICCHI, G.
2039
PLUCHINOTTA, A.
2596
PODYMOVA, S.D.
2340
POKROVSKII, G.A.
2263
POLEY, J.R.
2549*
POMOGAEVA, A.P.
2375
PONZ DE LEON, M.
2515
POORT, C.
1863*
POORT, S.R.
1863*
POPE, C.E., II
2086
POPOVA, L.A.
2403
PORT, R.B.
2204*
PORTA, E.A.
1893*
POST, C.
1789
POSTAIRE, J.G.
1756*
POSTNIKOVA, N.V.
2582
POTET, F.
2553, 2625
POTHE, H.
2091
POTTER, B.J.
2292*
POULSEN, J.H.
1854*
POULSEN, P.E.
2179
POUPON, R.
1882*
POUYET, M.
2123
PRADAYROL, L.
1869
PRAXMARER, C.
2559
PREISIG, R.
2009
PRELLWITZ, W.
2607
PRESTON, F.E.
2516
PREUD'HOMME, J.L.
2293
PREVOT, J.
2279
PRIEMYSHEVA, A.V.
2134
PRINCIPE, A.
2039
PRINGOT, J.
2601
PROCIANOY, R.S.
2346
PROKOPENKO, O.P.
2114
PROSSER, I.H.
2490
PROTELL, R.
1827
PROTOKLITOVA, N.S.
2576, 2581
PRUGLO, Y.V.
2121

PSACHAROPOULOS, H.
2520
PURI, P.
2235*
PUSHKAR, M.S.
2385
QIZILBASH, A.H.
2202*
QUATRE, J.L.
2438
QUEZEDE, J.
2282
QUINLAN, M.F.
1768*
QUINTANA, N.
1849*
RACUSEN, L.C.
1708*
RADIVOJEVIC, D.
2024
RAEDER, M.
1876
RAI, G.S.
2006
RAIA, A.
2010
RAINS, A.J.H.
1992
RAKELA, J.
2417, 2418
RALL, M.B.
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RAMACHANDRAN, C.K.
1904*
RAMAKRISHNAN, C.V.
1976
RAMIARA, Y.
2208
RAMPAZZO, G.
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RANDLES, J.
1716*
RANDOLPH, J.G.
2084
RAO, J.J.
2321
RAO, N.S.
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RAPIN, J.R.
1961
RAPOPORT, P.J.
2055
RASKIN, J.B.
2047
RASMUSSEN, S.N.
1704*
RASULEV, R.M.
2570
RATTO, G.B.
1911
RAY, M.B.
2372*
RAYFORD, P.L.
1801*, 1839
RAYNAUD, B.
2398
RAZUKAS, V.A.
2147
READ, N.W.
1717*
REDDY, A.N.
2473*
REDEKER, A.G.
2417, 2418, 2424
REED, J.D.
1810*, 2199
REES, W.D.W.
1814*
REGAN, P.T.
2000*, 2305*
REHFELD, J.F.
2167*
REHM, W.S.
1811*
REHPENNING, W.
2603
REICHERT, T.J.
2060*
REICHLE, F.A.
1909*
REICHLE, R.M.
1909*
REIFFERSCHEID, P.
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REIKOWSKI, J.
2452
REINER, T.
2307
REINKEN, L.
2230
REMACLE, J.P.
2439
RENNER, H.
2093
REUTER, I.
1782
REUTER, W.
2120
REVENOK, E.N.
2113
REY, C.
2339
REY, J.
2234
REYES, H.M.
2059*
REYNIER, M.O.
1929
REYNOLDS, E.S.
1769*
REYNOLDS, T.B.
2424
RHODES, J.
1814*
RHODES, J.B.
2106
RIABYSHENKO, V.O.
2394
RICHARDSON, R.
2111*
RICHTER, A.
2093
RICHTER, V.
2459
RICKWOOD, A.M.K.
2209
RICOUR, C.
2563, 2628
RIDDELL, R.H.
2239*
RIEDERS, E.R.
1799*
RIEDLER, L.
2283
RIFKIN, G.D.
2240*
RIJKE, R.P.C.
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RIMSTEN, A.
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RIPOLI, G.
2028
RISTELI, J.
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RITCHIE, J.K.
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RIVKIN, V.L.
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ROBERT, F.
1985*
ROBERTS, R.K.
1991
ROBERTSON, J.A.
1742
ROBLES, G.
1741
RODGERS, J.B.
1941, 1942
RODO, M.
2358
RODRIGUEZ, N.
2025
ROHNER, A.
2620
ROHRDANZ, D.
2238*
ROKKJAER, M.
1806*
ROLAND, M.
1848, 2187
ROMAGNOLI, U.
2028
ROMANOV, M.V.
2581
RONCORONI, L.
1785, 2448, 2449
ROS, E.
1881*
ROSCH, W.
1774
ROSCHLAU, G.
2437
ROSE, R.C.
1860*
ROSEKRANS, P.
2541*
ROSELLO, R.
2019
ROSENMANN, E.
1897*
ROSENTAL, E.
1946
ROSLER-ENGLHARDT, A.
2344

ROSS, P.E.
2522
ROSSI-FANELLI, F.
1960
ROSTOCK, K.
2463
ROTTHAUWE, H.W.
1821
ROUSSEAU, C.
2404
ROUSSEL, P.
2441
ROVATI, A.L.
1841
ROY, C.C.
1736, 2302*
ROY, V.P.
2573
ROZANOV, I.B.
2022
ROZE, C.
1873
ROZENBAUM, Y.M.
2270
ROZHNOVA, S.S.
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ROZITIS, J., JR.
1836
RUBIN, C.E.
1827, 2044
RUCKEBUSCH, Y.
1753*
RUDE, J.C., III
2002*
RUDENS'KA, I.M.
2379, 2382
RUDICK, J.
1713*
RUEDI, T.
2361
RUPPIN, H.
1737, 1754*
RUSSELL, R.I.
2544*
RUWART, M.J.
1800*
RYABININA, N.E.
2446
RYABOV, S.I.
2157
RYABTSEV, V.G.
2552
RYAN, J.
1772*
RYBICKA, J.
2171*
RYSS, E.S.
2157
SABATINO, B.
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SABESIN, S.M.
1947
SACCHETTI, G.
1785
SACCHETTI, L.
2030
SACCO, R.
2337
SACK, R.B.
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SADEGHI, A.
2090
SAEZ-ALQUEZAR, A.
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SAFONOVA, E.S.
2405
SAFRANY, L.
2523
SAGANDYKOV, B.B.
2406
SAGNELLI, E.
2416
SAHEKI, T.
1888*
SAHEL, J.
2169*
SAID, S.
1839
SAINT-JACQUES, I.
2556
SAISHO, H.
2538
SAITO, T.
2151
SAITOH, Y.
2325
SAKAI, A.
1986*
SAKAI, N.
2105
SAKAMOTO, Y.
1907*
SAKHAROVA, T.N.
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SAKS, M.K.
1799*
SALA, B.M.
2534
SALASPURO, M.P.
2415
SALATI, R.
2534
SALDANHA, L.B.
2346
SALEN, G.
1928
SALERA, M.
1817
SALVATORI, G.
2028
SALVIOLI, G.
2534
SALVIOLI, G.F.
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SAMPEDRO, A.
2274
SAMSIOE, G.
2480
SAMSON, E.I.
2128
SANDERS, S.S.
1811*
SANDLE, G.I.
1735
SANFORD, P.A.
1706*
SANTINI, D.
1817
SANTOS, R.
2036
SARIMO, S.S.
1787*
SARLES, H.
1861*, 1878, 2169*
SARNA, S.K.
1749*
SASE, M.
1888*
SATO, T.
2540
SAUERBRUCH, T.
2400
SAUNDERS, J.H.B.
2166*
SAVARY, M.
2125
SAVIN, M.A.
1729
SAVOLA, J.
2186
SAVOYE, B.
2440
SAXON, A.
2203*
SCARPELLO, J.H.B.
1995*, 2623*
SCHAAL, K.P.
2255
SCHAFFALITZKY DE MUKADELL, O.B. 1871
SCHAFFNER, U.
2408
SCHALLY, A.V.
1810*
SCHALM, S.W.
2413*
SCHAPIRO, R.H.
2236*
SCHAUER, K.
2120, 2145
SCHAUER, R.C.
1978
SCHEIBNER, K.
2609
SCHENKER, S.
1723*, 1732, 1991
SCHENONE, H.
2036
SCHIESSEL, R.
2077
SCHIFF, E.R.
1991
SCHILLER, C.
1964*
SCHIMMEL, G.
2510
SCHIMMELPFENNIG, W.
2408, 2447, 2456, 2589
SCHLAG, P.
2141
SCHMID, M.
2460

SCHMID, R.
1936
SCHMIDT, A.
2314
SCHMIDT, H.D.
2458
SCHMITT, I.
2621
SCHMITT, M.G.
1737
SCHMITZ, J.
2234
SCHMITZ-MOORMANN, P.
1993
SCHNEIDER, G.
2408, 2447, 2456
SCHOMERUS, H.
2421
SCHOTTENFELD, D.
2237*
SCHRAGER, J.
1818
SCHRODER, H.J.
2510
SCHRUMPF, E.
1990
SCHULZ, F.
2428
SCHULZE, K.
1701, 1746*, 1747*
SCHWARTZ, C.
1925
SCHWARTZEL, E.H., JR.
2163*
SCHWARZ, L.R.
1884*, 1885*
SCHWEISGUTH, O.
2563
SCHWENK, M.
1884*, 1885*
SEEFELD, U.
2070*
SEELIG, H.P.
2316
SEELIG, R.
2316
SEELY, J.R.
2549*
SEGOVIA DE ARANA, J.M.
1900*
SEIFERT, E.
2003*, 2495
SELLAH, A.
2282
SELLEY, M.L.
1919
SELMECI-ANTAL, M.
1952
SEMELLE, B.
1933
SEMENDYAEVA, M.E.
2402, 2429
SENCZUK, W.
1955
SENOKOSOV, N.I.
2162
SEPETJIAN, M.
2393
SERAFINO, X.
2019
SEREBRO, H.
2295
SERLIN, O.
2152
SERRA, D.
1852*
SETKA, J.
2033
SETO, D.S.
2061*
SGOBBA, G.
2448, 2449
SHABALIN, V.V.
2406
SHAFFER, R.D.
1776
SHAFIEPOOR, H.
2090
SHALYGINA, N.B.
2569
SHARGHI, G.
1792*
SHATROV, I.I.
2401
SHAW, B.
2199
SHEA, J.A.
2073*
SHEAHAN, D.G.
2066*, 2242*
SHEINER, H.J.
1768*
SHERLOCK, P.
2050, 2237*
SHERLOCK, S.
2468*
SHERMETA, D.W.
2061*
SHIKATA, T.
1903*
SHILS, M.E.
2306*
SHIMANO, M.
2537
SHINER, M.
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SHIRAZI, S.
1701
SHOVE, D.C.
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SHUMAKOV, V.I.
2359, 2587
SIAN, M.S.
1992
SIDIROPOULOS, D.
1920
SIEBENMANN, R.E.
2070*
SIEBER, A.M.
2060*
SIEBER, H.
2395
SIEBER, W.K.
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SIES, H.
1889*
SIKJAR, B.
2057
SILK, D.B.A.
1711*, 2223*, 2335*
SILVA, G.L.
2528
SILVA, J., JR.
1984*, 2240*
SILVERMAN, L.
2334*
SILVERSTEIN, F.E.
1827, 2044
SILVIS, S.E.
2038
SIMITZIS-LE-FLOHIC, A.M.
2618
SIMMONDS, W.J.
1725*
SIMON, B.
1845
SIMON, F.R.
1902*
SINGH, V.N.
1904*
SIPPONEN, P.
2415
SJODIN, L.
1858*
SJOVALL, J.
1883*
SKAANE, P.
2264
SKAUG, O.E.
1990
SKINNER, D.B.
1815*, 2102, 2108, 2298*
SKJELKVALE, R.
2545*
SKRANPAKS, M.
1872
SKRIPNICHENKO, D.F.
2498
SLADEN, G.E.
1995*, 2623*
SLATER, S.D.
2367
SLAVIN, B.
2154
SLEPNEVA, L.V.
1918
SLOAN, H.
2067*, 2079
SLOAN, J.M.
2196
SMALL, D.M.
1881*
SMIIAN, I.S.
2387
SMIRNOV, Y.M.
2587
SMIRNOV, Y.V.
2585

SMITH, A.R.
1960
SMITH, J.D.
2549*
SMITH, M.
2231
SMITH, T.
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SMOLINSKA, K.
2222
SMUCKLER, E.A.
2220
SMY, J.R.
1870
SNAPE, W.J., JR.
1757*
SNIPES, R.L.
1724*
SOBESCHANSKAYA, E.A.
2492
SOBHON, P.
1696*
SOBOTA, K.
2622
SOBOTKA, F.
2309
SODETZ, F.J.
1807*
SOEHENDRA, N.
2491
SOEJIMA, K.
2151
SOERGEL, K.H.
1737
SOGAME, T.
2150
SOGNO, O.
2596
SOLOWAY, R.D.
1962, 2479, 2484, 2485
SORENSEN, T.I.A.
2221
SORIANO, H.
1728*
SOSNIK, H.
2351
SOTNIKOVA, V.N.
2040
SOUBEIRAN, P.
2578
SOUCKOVA, E.
2459
SOUMARMON, A.
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SPARVOLI, C.
2194
SPECK, W.T.
1905*
SPECTOR, M.H.
1968
SPENCE, R.W.
2198
SPENCER, R.P.
2430*
SPENNEY, J.G.
1793*, 1794*
SPERANSKY, N.P.
2568, 2572
SPERO, J.A.
2330*
SPIRO, B.L.
2528
SPRINGORUM, H.W.
2211
SRETARUGSA, P.
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STADAAS, J.O.
1784
STAFFA, G.
1912
STAIB, W.
1879*
STAMPFEL, G.
2283
STARODUB, N.S.
2391
STASHEVSKAIA, Z.A.
2394
STASIEWICZ, J.
1771*
STAVE, R.
1989
STEEN, S.
2181
STEFANI, P.
2450
STEMPIEN, S.J.
2185
STENDER, H.S.
2495
STENGG, R.
1709*
STERLIGOVA, N.D.
2581
STEVENS, D.P.
1987
STEVENS, R.H.
2203*
STEVENSON, C.C.
2205*
STEWART, E.T.
1776
STEWART, J.J.
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STIEHL, A.
1914, 2493, 2536
STOCHI, F.
2461
STOCK, C.
1866
STOCK, M.
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STOCK, W.
2255
STOCKARD, M.E.
1978
STOCKLEY, H.L.
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STOLARCZYK, J.
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STOLL, M.S.
1938
STOOL, S.E.
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STORCK, D.
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STRAKA, S.
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STRAUB, P.W.
2327*
STRAUS, E.
1980
STROBER, W.
2433*
STRUNZ, U.
1774
STRUZHKO, K.G.
2023
SUAREZ, G.I.
1741
SUDRE, Y.
2577
SUGIURA, M.
2074*
SUIFFET, W.
2352
SUMMERSKILL, W.H.J.
2164*
SUNDERMANN, A.
2467
SUPTEL, E.A.
2565
SUSINI, C.
1869
SUTHERLAND, E.
1902*
SUYAMA, T.
1727*
SUZUKI, H.
1903*
SVANIK, J.
1705*
SVENSSON, S.O.
1790, 1809*
SWELL, L.
1925, 1927
SWIERCZEK, J.S.
1839, 2165*
SYCHEVA, V.V.
2149
SYRBU, I.F.
2138
SZABO, S.
1769*, 1805*
SZALACH, E.
2505
SZALAJ, W.
1771*
SZCZEPANIEC, M.
2425
SZCZEPANIK, P.
2301*
SZEKELY, R.
2036
SZELENCZY, M.
1910
SZIKLAS, J.J.
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SZMURLO, J.
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TAGAMI, Y.
2080

TAGUE, L.L.
1983*
TAKAYANAGI, R.
1765*
TAKEUCHI, S.
1765*
TAKIMOTO, M.
2080
TALEV, J.N.
2163*
TAMEMASA, O.
1850*
TAMIR, M.
1710*
TAMURA, H.
2112*
TANNER, E.I.
2612
TARDER, G.L.
2225*
TAREEV, E.M.
2401
TARLOW, M.J.
2234
TAROZZI, C.A.
2411
TARPILA, S.
2482
TASHEV, T.
1823
TASHJIAN, A.H., JR.
1797*
TASLER, J.
1802*, 1867
TATSUTA, M.
2112*
TAVARELA VELOSO, F.
2615*
TAYLOR, K.B.
2156
TAYLOR, T.V.
1999*, 2191
TAYLOR, W.
1880*, 1883*
TEDESCO, F.
1744*
TELES DE CARVALHO, A.S.
2527
TEMPLEMAN, D.
1758*
TENOVUO, J.
1787*
TENTI, L.
2137
TEOCHAROVA, M.
2345
TEPPERMAN, B.L.
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TERCYAK, A.M.
2301*
TESSARI, R.
1852*
TETE, R.
2409
TEUFEL, H.
1872
TEZUKA, M.
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THALER, E.
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THALER, M.M.
1946
THANNER, F.
2031
THOMAS, C.
2211
THOMAS, F.B.
1777
THOMAS, R.J.S.
1953
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1754*
THOMPSON, I.J.
1768*
THOMPSON, J.B.
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THOMPSON, J.C.
1801*, 1839, 2165*
THORESON, C.M.
1834
THUNG, S.N.
2423
THURMAYR, G.R.
2020
THURMAYR, R.
2020
THURSTON, D.
1847
TIBBLING, L.
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TISCORNIA, O.M.
1878
TOCCHI, A.
2626
TODOROV, G.
1823
TOKUMITSU, T.
1972
TOMIC, T.
2024
TOMKINS, A.M.
1988, 2617*
TONNESEN, K.
1908*
TORRANCE, B.
1999*, 2191
TOUSSAINT, J.
2502
TOVO, P.A.
2030
TOWE, J.
2603
TOWNLEY, R.R.W.
2600
TRANCHANT, D.
2438
TRAYLOR, J.B.
1968
TREADWELL, C.R.
1714*
TREBOUX, M.
2123
TREICHEL, J.
2035
TREPO, C.
2393
TREPO, D.
2393
TRIER, J.S.
1805*
TRIPP, J.
2611
TRONCALE, F.J.
2242*
TROTMAN, B.W.
2479, 2484, 2485
TROTTER, S.
2288*
TROUT, H.H., III
1828
TROVATO, G.
2155
TRUBER, E.
2035
TRUEX, C.R.
1891*, 1956
TRUJILLO RODRIGUEZ, L.
2258
TRUX, F.
2467
TSIKROVICH, V.L.
2497
TSIMMERMAN, Y.S.
2558
TSITSKISHVILI, G.V.
1916
TSO, P.
1725*
TSOY, G.V.
2023
TUDERMAN, L.
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TURCZ, T.
2293
TURNBULL, A.
2306*
TURNER, P.
2597
TURNHEIM, K.
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TUSZEWSKI, M.
2222
TYMPNER, F.
2307
TYTGAT, G.N.
1994*, 2253
UCHAIKIN, V.F.
2381
UCHIDA, K.
2474*
UDALL, J.N.
1728*
UEDA, I.
1921
UEDA, N.
1853*
UEMURA, T.
2545*
UGARTE, M.
2364
ULITKO, R.V.
2567
ULIVELLI, A.
2574

UPYREV, A.V.
2338
URAKAMI, Y.
2003*
UTILI, R.
1901*
UTSONOMIYA, J.
2247
UZAWA, T.
1903*
VACCARI, G.
2360
VACHON, A.
2409, 2438
VAGNE, M.
1820
VAHOUNY, G.V.
1714*
VAILLE, C.
1873
VAISMAN, S.L.
2481
VAKULIN, G.M.
2566, 2571
VAL-CARRERES GUINDA, A.
2122
VALENTINI, M.
2140, 2319
VALET, J.P.
2404
VALLANIA, G.
2593
VALLEE, B.L.
1894*
VALOIS, M.
2577
VAN BLANKENSTEIN, M.
2413*
VAN DEN BERGEN, C.J.
2303*
VAN EWIJK, W.
1695*
VAN GEMUND, J.J.
2213
VAN GOOL, J.D.
1780
VAN HOUTTE, N.V.
1756*
VAN HUSEN, N.
2523
VAN LAETHEM, A.
2502
VAN LESSEN, H.
2211
VAN PEER, A.P.
1892*
VAN TONGEREN, J.H.M.
2550*
VANAT, I.M.
2394
VANDERHOOF, J.A.
2055
VANDERSCHUEREN-LODEWEYCKX, M.
2227
VARGA, D.
2011
VAYSSE, N.
1869
VAZQUEZ, A.
2364
VEGA, D.F.
1855*
VENABLES, C.W.
2199
VENGESA, P.B.
1702
VENNES, J.A.
2038
VENTURINI, M.
1911
VERESHCHAGIN, I.A.
2391
VERINE, H.
1878
VERMACE, S.J.
2416
VERNET-NYSSEN, M.
2440
VERNIAEVA, T.I.
2466
VETTER, K.
2343
VIAL, J.
1902*
VIERLING, J.M.
2433*
VIERUCCI, A.
2407
VIGNAL, J.
2625
VILLAR, H.V.
1801*
VINOGRADOV, V.A.
2308
VINOGRADOVA, L.G.
2429
VIO, P.M.A.
2213
VIOLI, V.
2448, 2449
VIRABIAN, T.L.
2124
VISEK, W.J.
1891*, 1956
VITTORIA, G.
2280
VLAHCEVIC, Z.R.
1925, 1927
VOELKEL, E.F.
1797*
VOGEL, H.
2501
VOGL, T.P.
1905*
VOIGTSBERGER, P.
2091
VOJTISEK, V.
2269
VOLLNAR, M.
2609
VON LOWIS, R.
2035
VOROTYNTSEVA, N.V.
2576
WACK, R.
2408
WACK, V.
2408
WAGNER, J.C.
2443
WAGNER, K.
2447, 2456
WAHAB, A.
2041
WAKASUGI, H.
2322
WALAN, A.
1789, 2174, 2176, 2177
WALDEN, R.
1964*
WALDRAM, R.
2335*
WALTER, F.
1912
WALTMAN, A.C.
2236*
WANDS, J.R.
2422
WANG, S.
1991
WANICHANON, C.
1696*
WAPNICK, S.
2473*
WARNATZ, H.
2243
WARNES, T.W.
2532
WARREN, K.S.
1997*
WARSHAW, A.L.
2236*
WARTER, J.
2357
WATANABE, H.
1887*
WATANABE, H.Y.
1843
WATANABE, K.
1843
WATANABE, M.
1764*
WATANABE, T.
2105
WATERFALL, W.E.
1749*
WATKINS, J.B.
2301*
WATTS, G.T.
2518
WAY, L.
1948
WEBB, J.P.W.
1711*
WEBB, L.J.
2468*
WEBER, A.M.
2302*
WEBER, F.L., JR.
1730
WEBER, V.
2348
WEBSTER, P.D., III
1862*

WEHBA, J.
2525, 2526
WEHR, H.
2358
WEIGL, E.
2395
WEIHRAUCH, T.R.
2607
WEILL-BOUSSON, M.
2284
WEIMANN, S.
2283
WEIMAR, W.
2413*
WEINER, M.
2475*
WEIS, H.
2536
WEISBRODT, N.W.
1752*
WEISER, H.
1940
WEISER, M.M.
1981
WEISER, W.Y.
1958
WEISGERBER, G.
2441
WEITEMEYER, R.
2523
WENDLING, P.
2458
WERLIN, S.L.
2287*
WERNER, B.
2491
WERNER, H.
2621
WESER, E.
1968
WESLEY, J.R.
2206*
WESTON, N.E.
2485
WHARTON, B.A.
2611
WHEELER, M.H.
1814*
WHEELER, P.G.
2435*
WHELAN, G.
2219
WHITCOMB, F.F.
2008
WHITFIELD, P.F.
1819
WHITINGTON, P.F.
2061*
WICHERN, W.A., JR.
2159
WICHT, U.
2408
WIDERA, H.
2504
WIKLUND, L.
2210
WILHELM, A.
2139
WILKINSON, G.R.
1991
WILKINSON, S.P.
2435*
WILLEMS, G.
1803*, 1824
WILLIAMS, B.
1814*
WILLIAMS, C.B.
2290*
WILLIAMS, J.A.
1854*
WILLIAMS, R.
2335*
WILLMEN, R.
2027
WILMERS, M.
2611
WILSON, F.A.
1723*
WINAND, J.
1945
WINANS, C.S.
1748*
WINAWER, S.J.
2050, 2237*
WINCKLER, K.
2012, 2312, 2316
WINGATE, D.L.
1754*
WISEMAN, D.A.
1973
WISNIEWSKA, D.
2358
WITTMANN, D.H.
2510
WITZEL, L.
1795*
WOLFE, H.J.
1797*
WOLFE, M.M.
1777
WOLFF, H.
2454
WOLFRUM, D.I.
2312
WOLPERT, E.
1741
WONG, K.P.
2517
WOOD, C.
1737
WOOD, J.D.
1746*
WOOD, R.A.B.
1815*, 2299*
WOPFNER, F.
2243
WORK, C.O.
1984*
WORMSLEY, K.G.
2166*
WORNING, H.
1871
WRANNE, L.
2598
WRIGHT, B.M.
2046
WRIGHT, R.
2420
WRIGHT, S.G.
2617*
WUNSCH, E.
1754*, 1802*
WURBS, D.
2530, 2531
YAKHONTOVA, L.V.
2040
YAKUSHIN, V.I.
2022, 2207*
YALOW, R.S.
1980
YAM, A.
1849*
YAMAGISHI, T.
1766*
YAMAGUCHI, K.
2370
YAMAMURA, H.
2112*
YAMASHIRO, M.
2275
YAMAUCHI, H.
2540
YAO, T.
2246
YAP, S.H.
2550*
YASUHARA, H.
1921
YOUNG, E.A.
1968
YOUNG, J.A.
1743
YOUNG, V.L.
2205*
YOUSEF, I.M.
1926, 1931, 1932
YURYAVICHUS, I.R.
2147
YUSHCHUK, N.D.
2569
ZABINSKI, M.P.
1750*
ZAIDMAN, V.E.
2142
ZAJICEK, G.
1897*
ZAKI, G.
1928
ZALAY, A.W.
1836
ZALEWSKI, J.
2471*
ZAMBARDA, E.
2470*, 2535
ZAMCHECK, N.
2021
ZANOBONI, A.
2135
ZARRINDAST, M.R.
1792*
ZASLAVSKY, C.
2528

ZAVGORODNII, V.I.
2392
ZAVGORODNY, L.G.
2149
ZAVIACIC, M.
1816
ZEEGEN, R.
2490
ZEGERS DE BEYL, D.
2444
ZEIGHMANI, E.
2090
ZELMANOVICZ, M.
2528
ZENONE, E.A.
1937, 1938
ZHITNJUK, R.I.
2586
ZHIVITSIA, L.V.
2386
ZHURAVLEV, V.A.
2359
ZIEGLAUER, H.
2230
ZIELINSKA, W.
2365*
ZIEVE, L.
2432*
ZIMMERMAN, H.J.
1901*
ZIMMERMANN, H.B.
2456
ZIMMERMANN, S.
2465
ZIMMON, D.S.
2477, 2478
ZIPARO, V.
1960
ZIRONI, F.
2535
ZLATEWA, M.
2602
ZOPPI, G.
2228
ZUCCATI, G.
2407
ZUCKER, P.
2368
ZUCKERMAN, L.
1840
ZUFAROV, K.A.
2570
ZUNFT, H.J.
1718*

NUMBERS FOLLOWED BY AN ASTERISK INDICATE ABSTRACTS. OTHER NUMBERS REFER TO CITATIONS.

ABDOMEN
  RADIOTHERAPY
    COMPLICATIONS, 2542*, 2610
  SURGERY
    DRUG EFFECTS ON, 2586

ABSORPTION
  COLON
    AGE FACTORS, 1720*
    NEONATE, 1720*
  CYSTIC FIBROSIS
    FATS, 2303*
    PHOSPHOLIPIDS, 2303*
    TRIGLYCERIDES, 2303*
  GASTRECTOMY
    CARBOHYDRATES, 2154
  H2 RECEPTOR ANTAGONISTS
    DRUG EFFECTS ON, 2177
  INTESTINE, LARGE
    FATS, 1724*
  INTESTINE, SMALL, 2583
    AMINO ACIDS, 1712*
    SCHISTOSOMIASIS, 1702
    VITAMIN B12, 1742
  IRON
    ANEMIA, 2157
    DUODENITIS, 2157
    GASTRITIS, 2157
  JEJUNUM
    AMINO ACIDS, 1712*
    HORMONE EFFECTS ON, 1739
  KIDNEYS
    VITAMIN C, 1740
  LIVER
    RADIATION EFFECTS ON, 2162
  RETICULOENDOTHELIAL SYSTEM
    RADIONUCLIDES, 2430*
  ULCER, PEPTIC
    H2 RECEPTOR ANTAGONISTS, 2174, 2177
  VITAMIN B12
    PREGNANCY, 1742

ACETYLCHOLINE
  COLON
    ION TRANSPORT, 1706*
  ION TRANSPORT
    DRUG EFFECTS ON, 1706*

ACHALASIA
  DEGLUTITION DISORDERS
    DIAGNOSIS, 2060*
    INFANT, 2060*
    THERAPY, 2060*
  ESOPHAGUS
    ANOMALY, CONGENITAL, 2060*
    DIAGNOSIS, 2060*, 2082
    INFANT, 2060*
    MOTILITY, 2083
    RADIOLOGY, 2082
    THERAPY, 2060*

ACID SECRETION
  SEE ALSO SECRETION
  DRUG EFFECTS ON
    H2 RECEPTOR ANTAGONISTS, 1813*
    HISTAMINE, 1813*
    ULCER, PEPTIC, 2181

ACID SECRETION (continued)
  DUODENUM
    ULCER, PEPTIC, 2165*, 2187, 2188
  ELECTROPHYSIOLOGY
    REVIEW, 1811*
  HISTAMINE
    SOMATOSTATIN, 1810*
  JEJUNUM
    FATS, 1837
  PENTAGASTRIN
    SOMATOSTATIN, 1810*
  SECRETION
    GASTRIN, 1824
  STOMACH, 1826
    ACIDITY, 2165*
    ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 1847, 2163*
    AGE FACTORS, 1821
    AMINO ACIDS, 1802*
    ANTRECTOMY, 2200
    ATROPINE, 1804*
    BILE, 1837
    CELIAC DISEASE, 2228
    CHLORIDES, 1812*
    DIETARY FACTORS, 1839
    DRUG EFFECTS ON, 1795*, 1804*, 1809*, 1813*, 1825, 1836, 1841, 1842, 1843, 1844, 1848, 2181, 2197
    ELECTROPHYSIOLOGY, 1811*
    FATS, 1837, 1839, 2172*
    GASTRIN, 1828, 1841
    GUANOSINE CYCLIC 3',5' MONOPHOSPHATE, 1847
    H2 RECEPTOR ANTAGONISTS, 1795*, 1813*, 1825, 1841, 1842, 1844, 2197
    HISTAMINE, 1813*, 1841, 1843, 1844
    HORMONE CONTROL, 1839
    HORMONE EFFECTS ON, 1828, 1843, 1846
    HORMONES, GASTROINTESTINAL, 1846
    INFANT, 1821
    INTESTINE, SMALL, 2201*
    NERVOUS CONTROL, 2172*
    PANCREAS, 1837
    PROSTAGLANDINS, 1825
    REVIEW, 1811*
    SMOKING, 1859*
    SOMATOSTATIN, 1810*
    ULCER, PEPTIC, 2164*, 2165*, 2180, 2181, 2188, 2201*
    VAGOTOMY, 1790, 2140, 2182, 2187, 2193, 2200
  ULCER, PEPTIC
    DISTENTION, 2166*
    VAGOTOMY, 2187

ACIDITY
  ESOPHAGEAL REFLUX
    CHILD, 2059*
    TECHNIQUES, 2059*
  ESOPHAGUS
    CHILD, 2059*
  STOMACH
    ACID SECRETION, 2165*
    ANTACIDS, 1834
    DRUG EFFECTS ON, 1834

ACIDITY (continued)
ULCER, PEPTIC, 2165*
VAGOTOMY, 2193

ACIDOSIS
DIURETICS
COMPLICATIONS, 2445

ACIDS
ALCOHOLISM
DIAGNOSIS, 2422
ESOPHAGUS, ARTIFICIAL
COLON, 1982
LIVER
MORPHOLOGY, 1914
TOXICITY, 1914
LIVER DISEASES, ALCOHOLIC
PLASMA, 2422

ADENOSINE CYCLIC 3',5' MONOPHOSPHATE
PANCREAS
BICARBONATE SECRETION, 1872
HORMONE EFFECTS ON, 1874
SECRETION, 1872
STOMACH
ACID SECRETION, 1847, 2163*
ANEMIA, PERNICIOUS, 2163*
DRUG EFFECTS ON, 2163*
GASTRIN, 2163*
HORMONE EFFECTS ON, 2163*
SECRETAGOGUES, 2163*
STOMACH DISEASES, 2163*
ULCER, PEPTIC, 2163*
ZOLLINGER-ELLISON SYNDROME, 2163*
ULCER
STRESS, 1792*

ADENOSINE TRIPHOSPHATASE
BILE CANALICULI
ENDOTOXINS, 1901*
CHOLESTASIS
ENDOTOXINS, 1901*
INTESTINE, SMALL
ALCOHOLS, 1723*
DRUG EFFECTS ON, 1723*
LIVER
ESTROGENS, 1902*
HORMONE EFFECTS ON, 1902*
SECRETION
BILE, 1927
BILE ACIDS AND SALTS, 1927

ADENOSINE TRIPHOSPHATE
STOMACH
DRUG EFFECTS ON, 1794*

ADENYL CYCLASE
PANCREAS
HORMONE EFFECTS ON, 1857*
STOMACH
DRUG EFFECTS ON, 1845
HISTAMINE, 1845
HORMONE EFFECTS ON, 1845

ADHESIONS
INTESTINAL OBSTRUCTION
AGE FACTORS, 2573
ETIOLOGY, 2573
IATROGENESIS, 2573
SURGERY, 2573

ADHESIVES
SEE TISSUE ADHESIVES

ADRENERGIC RECEPTOR AGONISTS
SERUM
GASTRIN, 1822

ADRENERGIC RECEPTOR BLOCKADERS
SERUM
GASTRIN, 1822

ALBUMINS
LIVER CIRRHOSIS
DIAGNOSIS, 2440
SERUM
ULCER, PEPTIC, 2550*
ZOLLINGER-ELLISON SYNDROME, 2550*
ZOLLINGER-ELLISON SYNDROME
DIAGNOSIS, 2550*

ALCOHOL OXIDOREDUCTASES
ALCOHOLISM
DIAGNOSIS, 1894*
CHEMICAL PROPERTIES, 1894*
ISOLATION
CHROMATOGRAPHY, 1894*

ALCOHOLIC LIVER DISEASE
SEE LIVER DISEASES, ALCOHOLIC

ALCOHOLISM
ANTIGENS
HYPERSENSITIVITY, 2425
DIAGNOSIS
ACIDS, 2422
ALCOHOL OXIDOREDUCTASES, 1894*
AMINO ACIDS, 2422
PLASMA, 2422
IMMUNOLOGY, 2425
INTESTINAL ABSORPTION
VITAMIN B1, 1732
INTESTINE, SMALL
VITAMIN B1, 1732
PANCREATITIS
ETIOLOGY, 2317
PANCREATITIS, CHRONIC, 2324
ETIOLOGY, 2315, 2325
PROGNOSIS, 2325
PLASMA
COENZYMES, 1991
TRANSPORT
VITAMIN B1, 1732
VITAMINS
COENZYMES, 1991

ALCOHOLS
DUODENUM
ION TRANSPORT, 1707*
INTESTINAL ABSORPTION
DRUG EFFECTS ON, 1723*
VITAMIN B1, 1723*
INTESTINE, SMALL
ADENOSINE TRIPHOSPHATASE, 1723*
LIVER
DRUG METABOLISM, 1890*
PEROXIDATION, 1895*
METABOLISM, 1894*, 1896*
PANCREAS
DRUG EFFECTS ON, 2310

ALKALINE PHOSPHATASE
BILE
CIRCULATION, 2532
BLIND LOOP SYNDROME, 1965*
INTESTINE, SMALL, 1974
CIRCULATION, 2532
LIVER
CIRCULATION, 2532
PYLORUS, 1974

ALKALOSIS
DIURETICS
COMPLICATIONS, 2445

ALLERGY
SEE HYPERSENSITIVITY

ALPHA FETOPROTEIN
EXCRETION, 1897*
LIVER
NEOPLASMS, MALIGNANT, 1897*
LIVER CIRRHOSIS
CARBON TETRACHLORIDE, 1897*
DRUG-INDUCED, 1897*
PANCREAS
NEOPLASMS, MALIGNANT, 2299*
URINE, 1897*

AMEBIASIS
DIAGNOSIS
ANTIBODIES, 2621
LIVER
REVIEW, 2615*

AMINO ACIDS
ALCOHOLISM
DIAGNOSIS, 2422
CELIAC DISEASE
INTESTINAL ABSORPTION, 2223*
DEFICIENCY, 1956
ILEUM
PARENTERAL ALIMENTATION, 1968
INTESTINAL ABSORPTION, 1712*, 1730
DIETARY FACTORS, 1710*
INTESTINE, SMALL
ABSORPTION, 1712*
JEJUNUM
ABSORPTION, 1712*
LIVER
METABOLISM, 1904*
LIVER CIRRHOSIS
DETOXIFICATION, 2452
LIVER COMA, 1960
LIVER DISEASES, ALCOHOLIC
PLASMA, 2422
LIVER INJURY
METABOLISM, 1950
METABOLISM
DRUG EFFECTS ON, 1904*
HYPOXIA, 1950
PANCREAS
SCANNING, SCINTILLATION, 1850*
SCANNING, SCINTILLATION
RADIONUCLIDES, 1850*
SECRETION
GASTRIN, 1802*
STOMACH
ACID SECRETION, 1802*
PARENTERAL ALIMENTATION, 1968

AMINO TRANSFERASES
HEMOPHILIA, 2330*
SERUM
AGE FACTORS, 2037
INFANT, 2037
NEONATE, 2037
TRANSFUSION, 2330*

AMMONIA
PORTACAVAL SHUNT
CLEARANCE STUDY, 1909*
METABOLISM, 1909*

AMPULLA OF VATER
SEE VATER'S AMPULA

AMYLASES
CHOLECYSTITIS
BILE, 2492
PANCREAS
HORMONE EFFECTS ON, 1858*
SECRETION, 1853*, 1854*, 1874
PANCREATIC DISEASES
CLEARANCE STUDY, 2311*
PANCREATITIS
BILE, 2492
CLEARANCE STUDY, 2311*, 2312
SECRETION
CALCIUM, 1853*
CERULEIN, 1853*, 1854*
CHOLECYSTOKININ, 1874
DRUG EFFECTS ON, 1853*, 1854*
HORMONE CONTROL, 1874
HORMONE EFFECTS ON, 1853*, 1858*, 1874
POTASSIUM, 1854*
SECRETIN, 1853*
SOMATOSTATIN, 1874
SERUM
STARCH, 2607

AMYLOIDOSIS
GASTROINTESTINAL SYSTEM, 2606
LIVER
DISEASES ASSOCIATED WITH, 2548*
ULTRASTRUCTURE, 2548*

ANALGESICS AND ANTIPYRETICS
GALLBLADDER
MOTILITY, 1785
STOMACH
DRUG EFFECTS ON, 1832
MORPHOLOGY, 1832

ANEMIA
ABSORPTION
IRON, 2157
DUODENITIS, 2157
GASTRITIS, 2157
IRON
DEFICIENCY, 2157, 2602
PANCREAS
NEOPLASMS, BENIGN, 2309
STOMACH
HISTOCHEMISTRY, 2602
MORPHOLOGY, 2602

ANEMIA, PERNICIOUS
DIAGNOSIS
VITAMIN B12, 2547*
GASTRITIS, ATROPHIC
ETIOLOGY, 2156
REVIEW, 2156
INTESTINAL ABSORPTION
VITAMIN B12, 2547*
MALABSORPTION SYNDROMES
VITAMIN B12, 2156
SERUM
GASTRIN, 2158
STOMACH
ADENOSINE CYCLIC 3',5'
MONOPHOSPHATE, 2163*
GASTRIN, 2158
POLYPS, 2158

ANESTHESIA
LIVER
OXYGEN, 1910

ANESTHETICS
HEPATITIS, NONVIRAL
DRUG-INDUCED, 2371
INTESTINE, SMALL
MOTILITY, 1786

ANGIOGRAPHY
HEPATITIS
CHILD, 2373
HEPATITIS, INFECTIOUS
CHILD, 2373
HYPERTENSION, PORTAL
CHILD, 2442
DIAGNOSIS, 2442
INTESTINAL OBSTRUCTION
MORPHOLOGY, 1998*
INTESTINES
ISCHEMIA, 2214
LIVER
NEOPLASMS, MALIGNANT, 2007
LIVER CIRRHOSIS
DIAGNOSIS, 2436
PERITONITIS
MORPHOLOGY, 1998*

ANGIOMA
SEE HEMANGIOMA

ANOMALY
CECUM, 2236*
COLON, 2236*
GALLBLADDER, 2504
ILEUM
AMNIOCENTESIS, 2209
INTESTINAL OBSTRUCTION
COLON, 2282
INTESTINE, LARGE, 2236*
OXIDOREDUCTASES
LIVER CIRRHOSIS, 2434*
PANCREAS
DISEASES ASSOCIATED WITH, 2304*
SURGERY, 2304*
PANCREATITIS
DISEASES ASSOCIATED WITH, 2304*

ANOMALY, CONGENITAL
BILIARY TRACT
REVIEW, 2476*
SURGERY, 2476*
DUODENUM
OBSTRUCTION, 2206*
PROGNOSIS, 2206*
ESOPHAGUS
ACHALASIA, 2060*
INTESTINAL OBSTRUCTION
PROGNOSIS, 2206*

ANORECTICS
SEE APPETITE DEPRESSANTS

ANORECTUM
SEE ALSO ANUS, RECTUM
MANOMETRY
TECHNIQUES, 2251
PRESSURE STUDY
CHILD, 1782
CONSTIPATION, 1782
INCONTINENCE, 1782
INFANT, 1782

ANTACIDS
ESOPHAGITIS
DRUG THERAPY, 2065*
ESOPHAGEAL REFLUX, 2065*
GASTRIN
DRUG EFFECTS ON, 2168*
PANCREATIC DISEASES
DRUG THERAPY, 2305*
SECRETION
GASTRIN, 2168*
SERUM
GASTRIN, 2168*
STOMACH
ACIDITY, 1834
PEPSIN, 1835
SECRETION, 1835

ANTI-ARRHYTHMIA AGENTS
HEPATITIS, NONVIRAL
DRUG-INDUCED, 2369

ANTI-INFLAMMATORY AGENTS
GALLBLADDER
MOTILITY, 1785
GASTRITIS
DRUG-INDUCED, 1833
STOMACH
DRUG EFFECTS ON, 1831, 1832
MORPHOLOGY, 1831, 1832

ANTIBACTERIALS
BILIARY TRACT
BACTERIAL INFECTIONS, 2509
GALLBLADDER
BACTERIAL INFECTIONS, 2509

ANTIBIOTICS
COLITIS
DRUG-INDUCED, 1984*, 2240*, 2276
DRUG THERAPY, 1984*
ETIOLOGY, 2240*
DYSENTERY
DRUG THERAPY, 2566

ANTIBIOTICS (continued)
GASTROINTESTINAL SYSTEM
SURGERY, 2604
LIVER INJURY
DRUG EFFECTS ON, 1928
SALMONELLOSIS
DRUG THERAPY, 2576

ANTIBODIES
AMEBIASIS
DIAGNOSIS, 2621
DYSENTERY, 2567
HEPATITIS
INFECTION, 1903*
REVIEW, 2400
HEPATITIS, INFECTIOUS
REVIEW, 2400
HEPATITIS, SERUM
INFECTION, 1903*
LIVER CIRRHOSIS
HUMORAL FACTORS, 1900*
LIVER CIRRHOSIS, OBSTRUCTIVE
DIAGNOSIS, 2439
LIVER DISEASES
DIAGNOSIS, 2344

ANTICHOLINERGIC AGENTS
SEE PARASYMPATHOLYTICS

ANTICOAGULANTS
LIVER INJURY
DRUG-INDUCED, 2589
ETIOLOGY, 2589

ANTICONVULSANTS
HEPATITIS, NONVIRAL
DRUG-INDUCED, 2368

ANTIGEN, AUSTRALIA
SEE AUSTRALIA ANTIGEN

ANTIGEN, CARCINOEMBRYONIC
SEE CARCINOEMBRYONIC ANTIGEN

ANTIGENS
ALCOHOLISM
HYPERSENSITIVITY, 2425
ENTEROCOLITIS
YERSINIA, 2580
HEPATITIS
INFECTION, 1903*
REVIEW, 2400
HEPATITIS, CHRONIC, 2416
HEPATITIS, INFECTIOUS
REVIEW, 2400
HEPATITIS, SERUM
INFECTION, 1903*
LIVER
BIOPSY, 2345
LIVER CIRRHOSIS
HUMORAL FACTORS, 1900*
LIVER DISEASES
DIAGNOSIS, 2344
PANCREAS
NEOPLASMS, MALIGNANT, 2299*
SCHISTOSOMIASIS
RADIOIMMUNOASSAY, 1997*

ANTIHYPERTENSIVE AGENTS
STOMACH DISEASES
DRUG-INDUCED, 2134

ANTINEOPLASTIC AGENTS
INTESTINE, SMALL
DRUG EFFECTS ON, 1696*
MITOSIS, 1696*
MORPHOLOGY, 1696*
ULTRASTRUCTURE, 1696*

ANTIOXIDANTS
LIVER
HISTOCHEMISTRY, 1955
PATHOLOGY, 1955

ANTITRYPSIN, ALPHA
SEE ALPHA 1 ANTITRYPSIN

ANTRECTOMY
BILE
REFLUX, 2200
DUODENUM
ULCER, PEPTIC, 2189
GASTRITIS, 2200
STOMACH
ACID SECRETION, 2200

ANTRUM
GASTRIN
CELLS, 1799*
FEEDING, 1801*
MITOSIS
GASTRIN, 1803*
HORMONE CONTROL, 1803*
HORMONE EFFECTS ON, 1803*
MOTILITY
NERVOUS CONTROL, 1783
NUCLEIC ACIDS
GASTRIN, 1803*
SECRETION
GASTRIN, 1801*
SOMATOSTATIN
CELLS, 1698*
TISSUE CULTURE
TECHNIQUES, 1799*
ULCER
ASPIRIN, 1830
DRUG-INDUCED, 1830
HISTAMINE, 1830

ANUS
SEE ALSO ANORECTUM
MOTILITY
GLUCAGON, 1759*
HORMONE EFFECTS ON, 1759*
SECRETIN, 1759*
PRESSURE STUDY
TECHNIQUES, 1780
SPHINCTER
HORMONE EFFECTS ON, 1759*
PRESSURE STUDY, 1780

APPENDIX
NEOPLASM METASTASIS
LYMPHATIC SYSTEM, 2264

APPETITE DEPRESSANTS
BILE ACIDS AND SALTS
EXCRETION, 1992
METABOLISM, 1992
FATS
EXCRETION, 1992
STEROLS
EXCRETION, 1992

ARTERIES
MESENTERY
ISCHEMIA, 2214

ASCITES
HEMORRHAGE
CHILD, 2441
ETIOLOGY, 2441
LIVER CIRRHOSIS
SURGERY, 2448
THERAPY, 2443, 2445
PANCREAS
FISTULA, 2441
SURGERY, 2447
THERAPY, 2447

ASCORBIC ACID
SEE VITAMIN C

ASPIRIN
ANTRUM
ULCER, 1830
STOMACH
DRUG EFFECTS ON, 1794*, 1831, 1832
ELECTROPHYSIOLOGY, 1793*, 1794*
ION TRANSPORT, 1793*
MITOCHONDRIA, 1794*
MORPHOLOGY, 1831, 1832
PERMEABILITY, 1793*
ULCER, 1830

ATRESIA
BILE DUCTS
NEONATE, 2476*
PROGNOSIS, 2469*
SURGERY, 2469*, 2476*, 2520
THERAPY, 2520
BILIARY TRACT
SEASONAL FACTORS, 2481
SURGERY, 2520
THERAPY, 2520
ESOPHAGUS
MANOMETRY, 2061*
SPHINCTER, 2061*
SURGERY, 2084, 2085
ILEUM
AMNIOCENTESIS, 2209

ATROPINE
ENDOSCOPY
TECHNIQUES, 2048
STOMACH
ACID SECRETION, 1804*
DRUG EFFECTS ON, 2148
SECRETION, 2148

AUSTRALIA ANTIGEN
ASSAY
TECHNIQUES, 2393
CARRIER STATE, 2404
CHILD, 2407
METABOLISM, 2407
DISEASES ASSOCIATED WITH
HEMOPHILIA, 2330*
LYMPHOMA, 2372*
NEOPLASMS, MALIGNANT, 2372*
EPIDEMIOLOGY, 2380
REVIEW, 2400
HAPTOGLOBINS, 2388
HEPATITIS
CARRIER STATE, 2407, 2408
CHILD, 2379, 2390
NECROSIS, 2390
REVIEW, 2399, 2400
HEPATITIS, CHRONIC
CARRIER STATE, 2408
CHILD, 2390
HEPATITIS, INFECTIOUS
CHILD, 2379, 2390
NECROSIS, 2390
REVIEW, 2399, 2400
LIVER
MORPHOLOGY, 2408
LIVER FUNCTION TESTS
CARRIER STATE, 2408
TRANSFUSION, 2330*

AUTOIMMUNE DISEASES
HEPATITIS
MORPHOLOGY, 2365*

BACTERIA
ENTERITIS
ETIOLOGY, 2612
INTESTINE, LARGE
DIETARY FACTORS, 1718*
INTESTINES
CHILD, 2582
MALABSORPTION SYNDROMES, 2226

BACTERIAL INFECTIONS
BILIARY TRACT, 2510
ANTIBACTERIALS, 2509
DRUG THERAPY, 2509
DIARRHEA
ETIOLOGY, 2557
DYSENTERY
ETIOLOGY, 2565
ENTERITIS
COMPLICATIONS, 2560
NECROSIS, 2560
ENTEROCOLITIS, NECROTIZING
COMPLICATIONS, 2560
GALLBLADDER, 2510
ANTIBACTERIALS, 2509
DRUG THERAPY, 2509
INTESTINE, SMALL
BILE ACIDS AND SALTS, 1971
CHILD, 2581
DRUG THERAPY, 2581
PATHOLOGY, 1971
PEPTIDE HYDROLASES, 1971
INTESTINES
BREATH TEST, 1995*
DIAGNOSIS, 2543*
ESCHERICHIA COLI, 2572

BARIUM
STOMACH
RADIOLOGY, 2035

BARRETT'S SYNDROME
ESOPHAGEAL REFLUX
SURGERY, 2086
ESOPHAGUS
GASTRIN, 2062*
MITOSIS, 2088
PRECANCEROUS CONDITIONS, 2087
REFLUX, 2086

BEZOARS
DIABETES
COMPLICATIONS, 2111*
STOMACH
DIABETES, 2111*

BICARBONATE SECRETION
SEE ALSO SECRETION
PANCREAS
ADENOSINE CYCLIC 3',5'
MONOPHOSPHATE, 1872
DRUG EFFECTS ON, 1860*, 1867
ENKEPHALINS, 1867
FATTY ACIDS, 1861*
GUANOSINE CYCLIC 3',5'
MONOPHOSPHATE, 1872
HORMONE CONTROL, 1871, 1873
HORMONE EFFECTS ON, 1858*, 1873, 1875
ION TRANSPORT, 1876
NARCOTICS, 1867
PROSTAGLANDINS, 1875
SECRETIN, 1871
SOMATOSTATIN, 1873
PANCREATIC DUCT
HORMONE CONTROL, 1856*
HORMONE EFFECTS ON, 1856*

BICARBONATES
DUODENUM
TRANSPORT, 1713*
INTESTINAL ABSORPTION, 1713*

BILE
ALKALINE PHOSPHATASE
CIRCULATION, 2532
BILE ACIDS AND SALTS
CHOLELITHIASIS, 2536
CHROMATOGRAPHY, 1880*
DRUG EFFECTS ON, 2536
ETHNIC FACTORS, 2489
METABOLISM, 1926
BILE CANALICULI
SECRETION, 1927
BILIRUBIN
PHOTOTHERAPY, 1938
CHEMICAL COMPOSITION
GALLBLADDER DISEASES, 2479
CHENODEOXYCHOLIC ACID, 1929
METABOLISM, 1926
CHOLECYSTITIS
AMYLASES, 2492
LIPASE, 2492
CHOLESTEROL
CHOLELITHIASIS, 2536
DRUG EFFECTS ON, 2536

BILE (continued)
CHOLESTEROL (continued)
METABOLISM, 1929
CHOLIC ACID, 1929
CIRCULATION, 1922
CONTRAST MEDIA, 1935
DRUG EFFECTS ON, 1935
CONTRAST MEDIA
CHROMATOGRAPHY, 2011
DUODENUM
ION TRANSPORT, 1707*
EXCRETION
ESTROGENS, 1887*
GALLBLADDER
CHEMICAL COMPOSITION, 2479
H2 RECEPTOR ANTAGONISTS
STOMACH, 1814*
HEIDENHAIN POUCH
H2 RECEPTOR ANTAGONISTS, 1814*
HEPATITIS, CHRONIC
BILE ACIDS AND SALTS, 2415
JAUNDICE, OBSTRUCTIVE
ETIOLOGY, 2519
PROGNOSIS, 2519
LIPIDS, 2535
BILE ACIDS AND SALTS, 2534
CYSTIC FIBROSIS, 2302*
DRUG EFFECTS ON, 2302*, 2534
ENZYMES, 2302*
ETHNIC FACTORS, 2489
LIVER CIRRHOSIS, OBSTRUCTIVE
BILE ACIDS AND SALTS, 2415
PANCREATITIS
AMYLASES, 2492
LIPASE, 2492
REFLUX
ANTRECTOMY, 2200
VAGOTOMY, 2200
SECRETION
ADENOSINE TRIPHOSPHATASE, 1927
DRUG EFFECTS ON, 1934
HORMONE EFFECTS ON, 1868
LIPIDS, 1881*
STEROIDS, 1934
SHUNT, INTESTINAL
CHOLELITHIASIS, 2221
LIPIDS, 2221
STEROLS, 1929
STOMACH
ACID SECRETION, 1837
WOUNDS AND INJURIES, 1814*
TRANSPORT
DRUG EFFECTS ON, 1881*

BILE ACIDS AND SALTS
BILE
CHOLELITHIASIS, 2536
CHROMATOGRAPHY, 1880*
DRUG EFFECTS ON, 2536
ETHNIC FACTORS, 2489
LIPIDS, 2534
METABOLISM, 1926
BILE CANALICULI
SECRETION, 1927
BILIARY TRACT
TRANSPORT, 1882*
BINDING
ESTROGENS, 1902*
HORMONE EFFECTS ON, 1902*

BILE ACIDS AND SALTS (continued)
CHOLAGOGUES AND CHOLERETICS, 2470*
CHOLELITHIASIS
DRUG THERAPY, 2534, 2536, 2588
CHOLESTASIS
BIOCHEMISTRY, 1932
TECHNIQUES, 2472*
CROHN'S DISEASE
DIAGNOSIS, 2623*
CYSTIC FIBROSIS, 2301*
MUCUS, 1919
DRUG THERAPY
REVIEW, 2588
DUODENUM
DIETARY FACTORS, 1970
NEONATE, 1970
EXCRETION
APPETITE DEPRESSANTS, 1992
DRUG EFFECTS ON, 1992
FETUS, 1920
HEPATITIS
BLOOD, 2383
CHILD, 2383
HEPATITIS, CHRONIC
BILE, 2415
HEPATITIS, INFECTIOUS
BLOOD, 2383
CHILD, 2383
HEPATOCYTES
SECRETION, 1884*
TRANSPORT, 1885*
INTESTINE, SMALL
BACTERIAL INFECTIONS, 1971
LIVER
CHOLESTASIS, 2524
CIRCULATION, 1921
ION TRANSPORT, 1933
METABOLISM, 2535
TOXICITY, 1921
TRANSPORT, 1882*
LIVER CIRRHOSIS, OBSTRUCTIVE
BILE, 2415
LIVER COMA
ETIOLOGY, 2335*
LIVER DISEASES
SERUM, 2410
LIVER INJURY
DRUG EFFECTS ON, 1928
METABOLISM
APPETITE DEPRESSANTS, 1992
CHENODEOXYCHOLIC ACID, 1930
DRUG EFFECTS ON, 1778, 1992
ENZYMES, 2535
LIPOPROTEINS, 1948
PARASYMPATHOLYTICS, 1778
SEX FACTORS, 1883
STOMACH, 1736
TRIGLYCERIDES, 1948
MICELLES
HORMONE EFFECTS ON, 2549*
NEONATE
DIETARY FACTORS, 1970
PLASMA
LIPIDS, 2534
SECRETION, 1922
ADENOSINE TRIPHOSPHATASE, 1927
SYNTHESIS
DRUG EFFECTS ON, 1881*
RADIATION EFFECTS ON, 1923

BILE ACIDS AND SALTS (continued)
SYNTHESIS (continued)
VITAMIN C, 1940
TOXICITY
DRUG EFFECTS ON, 1928
TRANSPORT
DRUG EFFECTS ON, 1885*
STEROIDS, 1885*

BILE CANALICULI
CHOLESTASIS
ULTRASTRUCTURE, 1931
ENDOTOXINS
ADENOSINE TRIPHOSPHATASE, 1901*
SECRETION
BILE, 1927
BILE ACIDS AND SALTS, 1927

BILE DUCTS
ATRESIA
NEONATE, 2476*
PROGNOSIS, 2469*
SURGERY, 2469*, 2476*, 2520
THERAPY, 2520
CALCULI
CHOLANGIOGRAPHY, 2495
DIAGNOSIS, 2495
RADIOLOGY, 2495
CHOLELITHIASIS
RADIOLOGY, 2471*
SURGERY, 2471*
CYSTS, 2505
ENDOSCOPY
PANCREATIC DUCT, 2003*
NEOPLASMS, MALIGNANT
SURGERY, 2486
THERAPY, 2486
OBSTRUCTION
CHOLANGIOGRAPHY, 2495
DIAGNOSIS, 2495
RADIOLOGY, 2495
SURGERY, 2503
CARDIOVASCULAR SYSTEM, 2500

BILE SALTS
SEE BILE ACIDS AND SALTS

BILIARY CIRRHOSIS
SEE LIVER CIRRHOSIS, OBSTRUCTIVE

BILIARY TRACT
ANOMALY, CONGENITAL
REVIEW, 2476*
SURGERY, 2476*
ATRESIA
SEASONAL FACTORS, 2481
SURGERY, 2520
THERAPY, 2520
BACTERIAL INFECTIONS, 2510
ANTIBACTERIALS, 2509
DRUG THERAPY, 2509
CHOLECYSTOKININ, 1800*
CONTRAST MEDIA
CHROMATOGRAPHY, 2011
CYSTS
SURGERY, 2476*
DRAINAGE
JAUNDICE, 2540

BILIARY TRACT (continued)
FISTULA, 2508
DIAGNOSIS, 2024
RADIOLOGY, 2024
GASTRIN, 1800*
HYPOPLASIA
NEONATE, 2476*
SURGERY, 2476*
SECRETION
CONTRAST MEDIA, 1935
DRUG EFFECTS ON, 1935
LIPIDS, 1935
SURGERY
COMPLICATIONS, 2117, 2506, 2510
REVIEW, 2476*
TRANSPORT
BILE ACIDS AND SALTS, 1882*

BILIARY TRACT DISEASES
DIAGNOSIS
CHOLANGIOGRAPHY, 2013, 2014, 2538
ENDOSCOPY, 2013, 2478
ENDOSCOPY, 2523
CHOLANGIOGRAPHY, 2013
INDOCYANINE GREEN
CLEARANCE STUDY, 2029
OBSTRUCTION
DIAGNOSIS, 2538
SURGERY, 2523

BILIRUBIN
BILE
PHOTOTHERAPY, 1938
LIVER
METABOLISM, 1936
TRANSPORT, 1939
METABOLISM
ENZYMES, 1937
OXIDATION, 1937
TECHNIQUES, 1936
TRANSPORT
DRUG EFFECTS ON, 1939

BIRTH
SEE PREGNANCY

BLEEDING
SEE ALSO HEMORRHAGE
CECUM
DYSPLASIA, 2236*
COLON
DYSPLASIA, 2236*
GASTROINTESTINAL SYSTEM
DIAGNOSIS, 2049
ENDOSCOPY, 2049
INTESTINE, LARGE
DYSPLASIA, 2236*
INTESTINE, SMALL
DIAGNOSIS, 2049
ENDOSCOPY, 2049
LIVER
WOUNDS AND INJURIES, 2361
LIVER INJURY
SURGERY, 2361
THERAPY, 2361
STOMACH
DIAGNOSIS, 2049
DRUG THERAPY, 1842
ENDOSCOPY, 2049

BLEEDING (continued)
STOMACH (continued)
H2 RECEPTOR ANTAGONISTS, 1842
ULCER, 2129

BLIND LOOP SYNDROME
ALKALINE PHOSPHATASE, 1965*
DISACCHARIDASES, 1965*
GLYCOPROTEINS
METABOLISM, 1965*
INTESTINES
ENZYMES, 1965*
LACTASE, 1965*
SUCRASE, 1965*

BLOOD
HEPATITIS
BILE ACIDS AND SALTS, 2383
CLOTTING, 2384
HEPATITIS, INFECTIOUS
BILE ACIDS AND SALTS, 2383
CLOTTING, 2384
HYPERTENSION, PORTAL
CLOTTING, 2459
NEOPLASMS
DIAGNOSIS, 2237*
FECES, 2237*
SULFHYDRYL COMPOUNDS
CHROMATOGRAPHY, 2432*
LIVER CIRRHOSIS, 2432*
LIVER COMA, 2432*

BLOOD FLOW
SEE CIRCULATION

BOMBESIN
SEE HORMONES, GASTROINTESTINAL

BUDD-CHIARI SYNDROME
CHILD
RADIOLOGY, 2346
SURGERY, 2346
SURVIVAL, 2346

BURNS, CHEMICAL
STOMACH, 2147

CALCIFICATION
LIVER
ECHINOCOCCOSIS, 2352

CALCIUM
PANCREAS
ION TRANSPORT, 1857*
SECRETION, 1857*
SECRETION
AMYLASES, 1853*

CALCULI
BILE DUCTS
CHOLANGIOGRAPHY, 2495
DIAGNOSIS, 2495
RADIOLOGY, 2495
PANCREATIC DUCT
ENDOSCOPY, 2523
SURGERY, 2523

CANCER
SEE NEOPLASMS

CARBOHYDRATES
COLON
SHUNT, INTESTINAL, 2218
FECES, 2598
GASTRECTOMY
ABSORPTION, 2154
INTESTINES
TRANSPORT, 1716*

CARBON TETRACHLORIDE
HEPATITIS, TOXIC
OXYGEN, 1962
LIVER CIRRHOSIS
ALPHA FETOPROTEIN, 1897*
LIVER INJURY
OXYGEN, 1962
METABOLISM, 1896*

CARCINOEMBRYONIC ANTIGEN
COLON
NEOPLASMS, MALIGNANT, 2021, 2243
LIVER
LIVER DISEASES, 2423
LIVER DISEASES, ALCOHOLIC, 2423
PANCREAS
NEOPLASMS, MALIGNANT, 2021, 2299*
RECTUM
NEOPLASMS, MALIGNANT, 2243, 2249
RADIOTHERAPY, 2249

CARCINOGENS
COLON
CHROMOSOMES, 1972
LIVER
DRUG EFFECTS ON, 1898*
TOXICITY, 1898*

CARCINOID TUMOR
GASTROINTESTINAL SYSTEM, 2596
INTESTINES
COMPLICATIONS, 2202*
ENTERITIS, 2202*
ISCHEMIA, 2202*
SCLEROSIS, 2202*

CARDIOVASCULAR SYSTEM
SEE ALSO CIRCULATION
BILE DUCTS
SURGERY, 2500
MALABSORPTION SYNDROMES
DISEASES ASSOCIATED WITH, 2583

CATHARTICS
COLON
MOTILITY, 1758*
COLONIC DISEASES
DRUG-INDUCED, 2553
EDEMA
DRUG-INDUCED, 2599
ELECTROLYTES
DEFICIENCY, 2599
DRUG EFFECTS ON, 2599

CECUM
SEE ALSO INTESTINE, LARGE
ANOMALY, 2236*
BLEEDING
DYSPLASIA, 2236*

CECUM (continued)
MEGACOLON
VALVE, 2273
MOTILITY
ELECTROPHYSIOLOGY, 1781
MUCOCELE, 2281

CELIAC DISEASE
DUODENUM
VITAMIN B6, 2230
IMMUNOLOGY, 2231
INTESTINAL ABSORPTION
AMINO ACIDS, 2223*
GLUCOSE, 1717*
PEPTIDES, 2223*
PROTEIN-LOSING ENTEROPATHIES, 2223*
INTESTINE, SMALL
IMMUNOGLOBULINS, 2229
ION TRANSPORT, 1717*
LYMPHOCYTES, 2600
JEJUNUM
LYMPHOCYTES, 2600
TRANSPORT, 1717*
SECRETION
HORMONES, 2227
SERUM
VITAMIN B6, 2230
STOMACH
ACID SECRETION, 2228
SECRETION, 2228

CERULEIN
PANCREAS
ELECTROPHYSIOLOGY, 1854*
SECRETION
AMYLASES, 1853*, 1854*

CHELATING AGENTS
STOMACH
DRUG EFFECTS ON, 1831
MORPHOLOGY, 1831
ULCER, 1831

CHEMICAL BURNS
SEE BURNS, CHEMICAL

CHEMOTHERAPEUTIC AGENTS
SEE ANTINEOPLASTIC AGENTS

CHEMOTHERAPY
SEE DRUG THERAPY

CHENODEOXYCHOLIC ACID
BILE, 1929
METABOLISM, 1926
BILE ACIDS AND SALTS
METABOLISM, 1930
CHOLAGOGUES AND CHOLERETICS, 2470*
CHOLELITHIASIS
DRUG THERAPY, 2493, 2513, 2522, 2533, 2536
LIVER
SYNTHESIS, 1925
PHARMACOLOGY, 2515

CHILD
ANORECTUM
PRESSURE STUDY, 1782

CHILD (continued)
ASCITES
HEMORRHAGE, 2441
AUSTRALIA ANTIGEN
CARRIER STATE, 2407
BUDD-CHIARI SYNDROME
RADIOLOGY, 2346
SURGERY, 2346
SURVIVAL, 2346
COLITIS
DIAGNOSIS, 2287*
PROGNOSIS, 2287*
SURGERY, 2287*
THERAPY, 2287*
COLITIS, ULCERATIVE
DIAGNOSIS, 2287*
DIET, 2628
PARENTERAL ALIMENTATION, 2628
PROGNOSIS, 2287*
SURGERY, 2287*
THERAPY, 2287*, 2628
CROHN'S DISEASE
DIET, 2628
PARENTERAL ALIMENTATION, 2628
THERAPY, 2628
DIARRHEA
DRUG THERAPY, 2555
THERAPY, 2556
DUODENUM
ULCER, PEPTIC, 2118
DYSENTERY
ETIOLOGY, 2568
ESOPHAGEAL REFLUX
ACIDITY, 2059*
DISEASES ASSOCIATED WITH, 2103
ESOPHAGUS
ACIDITY, 2059*
HEPATITIS, 2381, 2386
ANGIOGRAPHY, 2373
AUSTRALIA ANTIGEN, 2379, 2390
BILE ACIDS AND SALTS, 2383
CLOTTING, 2384
DIAGNOSIS, 2373
DRUG THERAPY, 2376, 2377
ERYTHROCYTES, 2385
HEMORRHAGE, 2375
IMMUNITY, 2405
IMMUNOLOGY, 2382
KIDNEYS, 2374
LIVER COMA, 2391
PROGNOSIS, 2390
THERAPY, 2374, 2375
HEPATITIS, CHRONIC
AUSTRALIA ANTIGEN, 2390
HEPATITIS, INFECTIOUS, 2381, 2386
ANGIOGRAPHY, 2373
AUSTRALIA ANTIGEN, 2379, 2390
BILE ACIDS AND SALTS, 2383
CLOTTING, 2384
DIAGNOSIS, 2373
L-DOPA, 2389
DOPAMINE, 2389
DRUG THERAPY, 2376, 2377
ERYTHROCYTES, 2385
HEMORRHAGE, 2375
IMMUNITY, 2405
KIDNEYS, 2374
LIVER COMA, 2391
PROGNOSIS, 2390

CHILD (continued)
HEPATITIS, INFECTIOUS (continued)
THERAPY, 2374, 2375
HEPATITIS, SERUM
IMMUNOLOGY, 2382
HYPERTENSION, PORTAL
ANGIOGRAPHY, 2442
DIAGNOSIS, 2442
INCONTINENCE
PREVENTION, 2271
INTESTINAL ABSORPTION
HEPATITIS, 2387
HEPATITIS, INFECTIOUS, 2387
INTESTINE, SMALL
BACTERIAL INFECTIONS, 2581
LYMPHOCYTES, 2600
INTESTINES
BACTERIA, 2582
NEOPLASMS, MALIGNANT, 2250
LIVER COMA
THERAPY, 2391
MENETRIER'S DISEASE
DIAGNOSIS, 2160
ETIOLOGY, 2160
PANCREAS
FISTULA, 2441
RECTUM
SURGERY, 2271
SALIVARY GLANDS
NEOPLASMS, 2594
RADIOLOGY, 2593
SALMONELLOSIS
DRUG THERAPY, 2576
STOMACH
ULCER, PEPTIC, 2118, 2130
ULCER, PEPTIC
DIAGNOSIS, 2130
ETIOLOGY, 2118, 2130

CHLORIDES
DUODENUM
ION TRANSPORT, 1713*
TRANSPORT, 1713*
ESOPHAGUS
ULCER, 2601
INTESTINAL ABSORPTION, 1713*
INTESTINE, SMALL
ULCER, 2601
STOMACH
ACID SECRETION, 1812*
ION TRANSPORT, 1812*
TRANSPORT, 1812*
ULCER, 2601

CHOLAGOGUES AND CHOLERETICS
BILE ACIDS AND SALTS, 2470*
CHENODEOXYCHOLIC ACID, 2470*

CHOLANGIOGRAPHY
BILE DUCTS
CALCULI, 2495
OBSTRUCTION, 2495
BILIARY TRACT DISEASES
DIAGNOSIS, 2013, 2014, 2538
ENDOSCOPY, 2013
CHOLANGITIS
DIAGNOSIS, 2517
COMMON BILE DUCT CALCULI
DIAGNOSIS, 2477, 2495

CHOLANGIOGRAPHY (continued)
COMPLICATIONS
LIVER, 2012
JAUNDICE
DIAGNOSIS, 2475*
JAUNDICE, OBSTRUCTIVE
DIAGNOSIS, 2475*
LIVER
NECROSIS, 2012
LIVER DISEASES
DIAGNOSIS, 2538
TECHNIQUES, 2014, 2475*

CHOLANGITIS
DIAGNOSIS
CHOLANGIOGRAPHY, 2517
HEMATOBILIA, 2336

CHOLECYSTITIS
BILE
AMYLASES, 2492
LIPASE, 2492
CIRCULATION, 1916
DIAGNOSIS, 2498
SCANNING, SCINTILLATION, 2499, 2521
ULTRASONOGRAPHY, 2521
DISEASES ASSOCIATED WITH
ULCER, PEPTIC, 2128
ENDOSCOPY, 2128
PANCREAS
MORPHOLOGY, 2023
SURGERY, 2497, 2498, 2507
THERAPY, 2497, 2498, 2507
ULCER, PEPTIC
DISEASES ASSOCIATED WITH, 2128

CHOLECYSTOGRAPHY
GALLBLADDER DISEASES
DIAGNOSIS, 2032
TECHNIQUES, 2028

CHOLECYSTOKININ
BILIARY TRACT, 1800*
COLON
ELECTROPHYSIOLOGY, 1757*
MOTILITY, 1757*
KIDNEY DISEASES
HORMONES, GASTROINTESTINAL, 2605
PANCREAS
HORMONE EFFECTS ON, 1858*
PANCREAS FUNCTION TESTS, 2020
SECRETION
AMYLASES, 1874
STOMACH, 1800*

CHOLEDOCHOLITHIASIS
SEE COMMON BILE DUCT CALCULI

CHOLELITHIASIS
BILE
BILE ACIDS AND SALTS, 2536
CHOLESTEROL, 2536
BILE ACIDS AND SALTS
DRUG THERAPY, 2588
BILE DUCTS
RADIOLOGY, 2471*

CHOLELITHIASIS (continued)
DIAGNOSIS
ENDOSCOPY, 2478
ULTRASONOGRAPHY, 2514
DRUG THERAPY
BILE ACIDS AND SALTS, 2534, 2536
CHENODEOXYCHOLIC ACID, 2493, 2513, 2522, 2533, 2536
TERPENES, 2511
ETIOLOGY, 2537
SHUNT, INTESTINAL
BILE, 2221
COMPLICATIONS, 2219
SURGERY
BILE DUCTS, 2471*

CHOLERA
DIARRHEA
ETIOLOGY, 2557
INTESTINES
ENTEROTOXINS, 1728*
WATER, ELECTROLYTE BALANCE, 1728*
PREVENTION, 2562

CHOLERESIS
DIARRHEA
THERAPY, 2544*
LIVER
ULTRASTRUCTURE, 1924
THERAPY
DIET, 2544*

CHOLERETICS
SEE CHOLAGOGUES AND CHOLERETICS

CHOLESTASIS
BILE ACIDS AND SALTS
BIOCHEMISTRY, 1932
TECHNIQUES, 2472*
BILE CANALICULI
ULTRASTRUCTURE, 1931
DIAGNOSIS
CLEARANCE STUDY, 2539
INDOCYANINE GREEN, 2539
INFANT, 2528
SCANNING, SCINTILLATION, 2528
DRUG-INDUCED
STEROIDS, 1885*
ENDOTOXINS
ADENOSINE TRIPHOSPHATASE, 1901*
ETIOLOGY, 2537
HEPATITIS
ETIOLOGY, 2409
HEPATITIS, INFECTIOUS
ETIOLOGY, 2409
INFANT, 2526
LIPOPROTEINS, 2480
LIVER
BILE ACIDS AND SALTS, 2524
GLUTAMYLTRANSPEPTIDASE, 2524
INFANT, 2525
NEOPLASMS, MALIGNANT
COMPLICATIONS, 2473*
DISEASES ASSOCIATED WITH, 2473*
SULFOBROMOPHTHALEIN
CLEARANCE STUDY, 2525

CHOLESTEROL
BILE
CHOLELITHIASIS, 2536
DRUG EFFECTS ON, 2536
METABOLISM, 1929
INTESTINAL ABSORPTION
ENZYMES, 1714*
WATER, 1731
LIPIDS
METABOLISM, 1942
LIVER
METABOLISM, 1941, 2535
METABOLISM
DIETARY FACTORS, 1941
ENZYMES, 1714*, 2535
LIPIDS, 1941
VITAMIN C, 1940
WILSON'S DISEASE
LIPIDS, 2358
METABOLISM, 2358

CHOLIC ACID
BILE, 1929
LIVER
SYNTHESIS, 1925

CHOLINERGIC AGENTS
SEE PARASYMPATHOMIMETICS

CHROMATOGRAPHY
ALCOHOL OXIDOREDUCTASES
ISOLATION, 1894*
BILE
BILE ACIDS AND SALTS, 1880*
CONTRAST MEDIA, 2011
BILIARY TRACT
CONTRAST MEDIA, 2011
BLOOD
SULFHYDRYL COMPOUNDS, 2432*
OXIDOREDUCTASES
LIVER CIRRHOSIS, 2434*
PLASMA
CONTRAST MEDIA, 2011
SALIVA
PROTEINS, 1787*
SULFHYDRYL COMPOUNDS
TECHNIQUES, 2432*
URINE
CONTRAST MEDIA, 2011

CHROMOSOMES
COLON
CARCINOGENS, 1972
CELLS, 1972
DRUG EFFECTS ON, 1972

CHYMOTRYPSIN
PANCREAS FUNCTION TESTS
FECES, 2307

CIRCULATION
SEE ALSO CARDIOVASCULAR SYSTEM
BILE, 1922
ALKALINE PHOSPHATASE, 2532
CONTRAST MEDIA, 1935
DRUG EFFECTS ON, 1935
CHOLECYSTITIS, 1916
COLON
DYSPLASIA, 2268

CIRCULATION (continued)
GASTROINTESTINAL DISEASES
INTESTINE, LARGE, 2585
HYPERTENSION, PORTAL
PORTACAVAL SHUNT, 2454
INTESTINAL ABSORPTION
RADIONUCLIDES, 1705*
INTESTINE, SMALL
ALKALINE PHOSPHATASE, 2532
INTESTINES
DRUG EFFECTS ON, 1983*
ENDOTOXINS, 2579
FOOD POISONING, 2584
H2 RECEPTOR ANTAGONISTS, 1983*
HISTAMINE, 1983*
LIVER
ALKALINE PHOSPHATASE, 2532
BILE ACIDS AND SALTS, 1921
MESENTERY
DRUG EFFECTS ON, 1983*
H2 RECEPTOR ANTAGONISTS, 1983*
HISTAMINE, 1983*
PANCREAS
HORMONE EFFECTS ON, 1875
PROSTAGLANDINS, 1875
WILSON'S DISEASE
SURGERY, 2337

CIRRHOSIS
SEE LIVER CIRRHOSIS

CIRRHOSIS, BILIARY
SEE LIVER CIRRHOSIS, OBSTRUCTIVE

CLOSTRIDIUM
DIARRHEA
DIAGNOSIS, 2545*
ENTEROTOXINS, 2545*
FOOD POISONING
DIAGNOSIS, 2545*
ENTEROTOXINS, 2545*

COENZYMES
PLASMA
ALCOHOLISM, 1991
VITAMINS, 1991
VITAMINS
ALCOHOLISM, 1991

COLITIS
ANTIBIOTICS
ETIOLOGY, 2240*
DIAGNOSIS
CHILD, 2287*
ENDOSCOPY, 2278
DRUG-INDUCED
ANTIBIOTICS, 1984*, 2240*, 2276
DRUG THERAPY, 1984*
ETIOLOGY, 2240*
DRUG THERAPY
ANTIBIOTICS, 1984*
ETIOLOGY
DYSENTERY, 2569
TOXINS, 2240*
ISCHEMIA
DIAGNOSIS, 2275
PROGNOSIS
CHILD, 2287*

COLITIS (continued)
SURGERY
CHILD, 2287*
COMPLICATIONS, 2287*
THERAPY
CHILD, 2287*

COLITIS, ULCERATIVE
CHILD
DIET, 2628
PARENTERAL ALIMENTATION, 2628
THERAPY, 2628
COMPLEMENT, 2292*
COMPLICATIONS
ILEITIS, 2296
DIAGNOSIS
CHILD, 2287*
DISEASES ASSOCIATED WITH
NEOPLASMS, MALIGNANT, 2290*, 2291*
DRUG THERAPY
ENEMA, 2295
METABOLISM, 2289*
ILEUM
COMPLICATIONS, 2296
IMMUNOLOGY, 2292*, 2293
NEOPLASMS, MALIGNANT
BIOPSY, 2290*, 2291*
DIAGNOSIS, 2290*, 2291*
REVIEW, 2291*
RISK FACTORS, 2290*, 2291*, 2294
PRECANCEROUS CONDITIONS
REVIEW, 2291*
PROGNOSIS
CHILD, 2287*
LYMPHOCYTES, 2288*
SERUM, 2288*
SURGERY
CHILD, 2287*
COMPLICATIONS, 2287*
THERAPY
CHILD, 2287*

COLLAGEN
LIVER CIRRHOSIS
SYNTHESIS, 1899*
LIVER INJURY
SYNTHESIS, 1899*

COLON
SEE ALSO INTESTINE, LARGE
ABSORPTION
AGE FACTORS, 1720*
NEONATE, 1720*
ANOMALY, 2236*
BLEEDING
DYSPLASIA, 2236*
CARBOHYDRATES
SHUNT, INTESTINAL, 2218
CELLS
CHROMOSOMES, 1972
CHROMOSOMES
CARCINOGENS, 1972
DRUG EFFECTS ON, 1972
CIRCULATION
DYSPLASIA, 2268
CROHN'S DISEASE, 2625
DIVERTICULUM, 2267

COLON (continued)
ELECTROPHYSIOLOGY
CHOLECYSTOKININ, 1757*
DRUG EFFECTS ON, 1757*
HORMONE EFFECTS ON, 1757*
PENTAGASTRIN, 1757*
PERFUSION, 1756*
ENDARTERITIS
RADIATION, 2610
ENDOSCOPY
TECHNIQUES, 2253
ESOPHAGUS, ARTIFICIAL
ACIDS, 1982
GALLBLADDER DISEASES
DISEASES ASSOCIATED WITH, 2501
RADIOLOGY, 2501
GANGRENE
SURGERY, 2269
INFARCTION
GANGRENE, 2269
INFLAMMATION
ENDOSCOPY, 2278
INTESTINAL OBSTRUCTION
ANOMALY, 2282
ION TRANSPORT
ACETYLCHOLINE, 1706*
DRUG EFFECTS ON, 1706*
NERVOUS CONTROL, 1706*
ISCHEMIA
CONTRACEPTIVES, ORAL, 2204*
MOTILITY
CATHARTICS, 1758*
CHOLECYSTOKININ, 1757*
DRUG EFFECTS ON, 1757*, 1758*
GLUCAGON, 1759*
HORMONE EFFECTS ON, 1757*, 1759*
PENTAGASTRIN, 1757*
PERFUSION, 1756*
SECRETIN, 1759*
NEOPLASM METASTASIS, 2260
NEOPLASMS, 2244
DIAGNOSIS, 2237*
NEOPLASMS, MALIGNANT
AGE FACTORS, 2238*
BIOPSY, 2290*, 2291*
CARCINOEMBRYONIC ANTIGEN, 2021, 2243
COMPLICATIONS, 2269
DIAGNOSIS, 2021, 2290*, 2291*
GANGRENE, 2269
IMMUNOLOGY, 2243
LYMPHOCYTES, 2238*, 2243
PROGNOSIS, 2021
RECURRENCE, 2021
REVIEW, 2291*
RISK FACTORS, 2290*, 2291*, 2294
PEUTZ-JEGHER'S SYNDROME
MORPHOLOGY, 2245
POLYPS, 2244
BIOPSY, 2242*
DIAGNOSIS, 2242*
DISEASES ASSOCIATED WITH, 2246
ENDOSCOPY, 2242*
GENETIC FACTORS, 2247
INTESTINE, SMALL, 2246
MORPHOLOGY, 2245
NEOPLASMS, BENIGN, 2246
PATHOLOGY, 2247

COLON (continued)
PRESSURE STUDY
PERFUSION, 1756*
RADIATION EFFECTS ON, 2610
RADIOLOGY, 2252
INFANT, 2041
TECHNIQUES, 2041, 2253
SCLERODERMA, 2265
SURGERY
DIET, 2254
TECHNIQUES, 2253, 2255, 2256
TRANSPORT
FATTY ACIDS, 1737
ULTRASTRUCTURE
AGE FACTORS, 1720*
NEONATE, 1720*

COLONIC DISEASES
DIAGNOSIS
FECES, 2543*
LEUKOCYTES, 2543*
DRUG-INDUCED
CATHARTICS, 2553
NERVOUS CONTROL, 2235*
REVIEW, 2257
SURGERY
DIET, 2254

COMMON BILE DUCT
DILATATION
CLASSIFICATION, 2474
ENDOSCOPY, 2518
MANOMETRY, 1776
MOTILITY, 1776
NERVOUS CONTROL, 1773*
MUSCLES
NERVOUS CONTROL, 1773*
PERFORATION
NEONATE, 2476*
SURGERY, 2476*
PRESSURE STUDY, 1776

COMMON BILE DUCT CALCULI
DIAGNOSIS
CHOLANGIOGRAPHY, 2477, 2495
ENDOSCOPY, 2477, 2478, 2518
RADIOLOGY, 2495
ULTRASONOGRAPHY, 2477
DRAINAGE
TECHNIQUES, 2530
DRUG THERAPY, 2512
ENDOSCOPY, 2483
THERAPY, 2512
DRAINAGE, 2530
ENDOSCOPY, 2529

COMPLEMENT
COLITIS, ULCERATIVE, 2292*
CROHN'S DISEASE, 2292*
INFLAMMATORY BOWEL DISEASES, 2292*
PANCREATITIS
PROGNOSIS, 2316
SERUM, 2316

COMPUTERS
LIVER
SCANNING, SCINTILLATION, 2006
TOMOGRAPHY
REVIEW, 2053

CONSTIPATION
ANORECTUM
PRESSURE STUDY, 1782
THERAPY
DIET, 2266

CONTRACEPTIVES, ORAL
COLON
ISCHEMIA, 2204*
INTESTINE, SMALL
ISCHEMIA, 2204*
JAUNDICE
REVIEW, 2332*
LIVER
NEOPLASMS, 2332*
LIVER FUNCTION TESTS
REVIEW, 2332*

CONTRAST MEDIA
BILE
CHROMATOGRAPHY, 2011
CIRCULATION, 1935
BILIARY TRACT
CHROMATOGRAPHY, 2011
SECRETION, 1935
ESOPHAGEAL REFLUX
DIAGNOSIS, 2076
HIATAL HERNIA
DIAGNOSIS, 2076
PLASMA
CHROMATOGRAPHY, 2011
STOMACH
RADIOLOGY, 2035, 2076
URINE
CHROMATOGRAPHY, 2011

COPPER
METABOLISM
WILSON'S DISEASE, 2356
PANCREAS
WILSON'S DISEASE, 2356

CORTICOSTEROIDS
SEE HORMONES, ADRENAL CORTEX

CROHN'S DISEASE
CHILD
DIET, 2628
PARENTERAL ALIMENTATION, 2628
THERAPY, 2628
COLON, 2625
COMPLEMENT, 2292*
DIAGNOSIS
BILE ACIDS AND SALTS, 2623*
BREATH TEST, 2623*
ENDOSCOPY, 2624
RADIOLOGY, 2624
IMMUNOLOGY, 2292*
MORPHOLOGY, 2626
PATHOLOGY, 2624
PYLORUS
STENOSIS, 2627
RECTUM, 2625

CRUVEILHIER-BAUMGARTEN SYNDROME
SEE LIVER CIRRHOSIS

CRYOSURGERY
HEMORRHOIDS, 2248

CYCLIC ADENOSINE MONOPHOSPHATE
SEE ADENOSINE CYCLIC 3',5' MONOPHOSPHATE

CYCLIC GUANOSINE MONOPHOSPHATE
SEE GUANOSINE CYCLIC 3',5' MONOPHOSPHATE

CYSTIC FIBROSIS
BILE
LIPIDS, 2302*
BILE ACIDS AND SALTS, 2301*
FATS
ABSORPTION, 2303*
MUCUS
BILE ACIDS AND SALTS, 1919
PHOSPHOLIPIDS
ABSORPTION, 2303*
PLASMA
LIPIDS, 2303*
TRIGLYCERIDES
ABSORPTION, 2303*

CYSTS
BILE DUCTS, 2505
ECHINOCOCCOSIS
SURGERY, 2362
ESOPHAGUS
DIAGNOSIS, 2094
PROGNOSIS, 2094
RADIOLOGY, 2094
LIVER
DIAGNOSIS, 2338
ECHINOCOCCOSIS, 2352
RUPTURE, 2620
THERAPY, 2338

CYTOCHROMES
LIVER, 1956

DEGLUTITION
ESOPHAGUS
MOTILITY, 1746*

DEGLUTITION DISORDERS
ACHALASIA
DIAGNOSIS, 2060*
INFANT, 2060*
THERAPY, 2060*
ESOPHAGUS
NEOPLASMS, MALIGNANT, 2063*, 2092
NEOPLASMS, MALIGNANT
DILATATION, 2092
THERAPY, 2092
SURGERY, 2063*, 2064*
THERAPY, 2063*, 2064*

DEHYDROGENASES
SEE OXIDOREDUCTASES

DERMATITIS HERPETIFORMIS
IMMUNOGLOBULINS, 2546*
REVIEW, 2546*

DETOXIFICATION
LIVER CIRRHOSIS
AMINO ACIDS, 2452

DIABETES
COMPLICATIONS
BEZOARS, 2111*
STOMACH
BEZOARS, 2111*
MOTILITY, 2111*

DIARRHEA
CHILD
DRUG THERAPY, 2555
THERAPY, 2556
CHOLERA
ETIOLOGY, 2557
CHOLERESIS
THERAPY, 2544*
CLOSTRIDIUM
DIAGNOSIS, 2545*
ENTEROTOXINS, 2545*
DIAGNOSIS
FECES, 2543*
LEUKOCYTES, 2543*
ESCHERICHIA COLI
SIMULATION, 1967*
ETIOLOGY
BACTERIAL INFECTIONS, 2557
OSMOTIC PRESSURE, 2554
TOXINS, 2557
FECES
LEUKOCYTES, 2543*
GASTRECTOMY
COMPLICATIONS, 2154
POLYSACCHARIDES, 2154
PREVENTION, 2154
HORMONES, GASTROINTESTINAL, 2564
INTESTINE, SMALL
LYMPHOCYTES, 2600
JEJUNUM
LYMPHOCYTES, 2600
NEOPLASMS, MALIGNANT
HORMONES, GASTROINTESTINAL, 2563
PREVENTION
POLYSACCHARIDES, 2154
SALMONELLOSIS
ETIOLOGY, 2557
SHIGELLOSIS
ETIOLOGY, 2557
STOMACH
SURGERY, 2154
THERAPY, 2557
DIET, 2544*
VAGOTOMY
COMPLICATIONS, 2154, 2191
PREVENTION, 2154
THERAPY, 2191

DIET
CHOLERESIS
THERAPY, 2544*
COLITIS, ULCERATIVE
CHILD, 2628
COLON
SURGERY, 2254
COLONIC DISEASES
SURGERY, 2254
CONSTIPATION
THERAPY, 2266
CROHN'S DISEASE
CHILD, 2628

DIET (continued)
DIARRHEA
THERAPY, 2544*
DUMPING SYNDROME
PREVENTION, 2116
ENTERITIS
INFANT, 2559
INTESTINE, LARGE
SURGERY, 2254
LIVER INJURY
HYPOXIA, 1950
PORTACAVAL SHUNT, 2343
RECTUM
SURGERY, 2254

DIGESTION
INTESTINE, SMALL
ENZYMES, 1974
LIPIDS
HORMONE EFFECTS ON, 2549*
PYLORUS
ENZYMES, 1974

DISACCHARIDASES
BLIND LOOP SYNDROME, 1965*
DEFICIENCY
DIAGNOSIS, 2598
FECES
DEFICIENCY, 2598

DISACCHARIDES
INTESTINAL ABSORPTION, 1711*
GLUCOSE, 1735

DISTENTION
INTESTINAL ABSORPTION
RADIONUCLIDES, 1705*
ULCER, PEPTIC
ACID SECRETION, 2166*
PEPSIN, 2166*

DIURETICS
COMPLICATIONS
ACIDOSIS, 2445
ALKALOSIS, 2445
ELECTROLYTES, 2445
LIVER CIRRHOSIS
COMPLICATIONS, 2445
ELECTROLYTES, 2445
THERAPY, 2445
MAGNESIUM
DEFICIENCY, 2435*
PANCREATITIS
ETIOLOGY, 2317
POTASSIUM
DEFICIENCY, 2435*

DIVERTICULUM
COLON, 2267

L-DOPA
HEPATITIS, INFECTIOUS
CHILD, 2389
METABOLISM, 2389
STOMACH
DRUG EFFECTS ON, 1832
MORPHOLOGY, 1832

DOPAMINE
HEPATITIS, INFECTIOUS
CHILD, 2389
METABOLISM, 2389

DRAINAGE
BILIARY TRACT
JAUNDICE, 2540
COMMON BILE DUCT CALCULI
TECHNIQUES, 2530
THERAPY, 2530
PANCREATITIS, CHRONIC
PAIN, 2313
STOMACH
SURGERY, 2139
TECHNIQUES, 2139

DRUG-INDUCED
ANTRUM
ULCER, 1830
CHOLESTASIS
STEROIDS, 1885*
COLITIS
ANTIBIOTICS, 1984*, 2240*, 2276
DRUG THERAPY, 1984*
ETIOLOGY, 2240*
COLONIC DISEASES
CATHARTICS, 2553
DUODENUM
ULCER, 1805*
EDEMA
CATHARTICS, 2599
ELECTROLYTES
DEFICIENCY, 2599
ESOPHAGUS
ULCER, 2601
GASTRITIS
ANTI-INFLAMMATORY AGENTS, 1833
PREVENTION, 1833
HEPATITIS, NONVIRAL
ANESTHETICS, 2371
ANTI-ARRHYTHMIA AGENTS, 2369
ANTICONVULSANTS, 2368
HYPERSENSITIVITY, 2367
IMMUNOLOGY, 2370
STEROIDS, 2367
HYPERTROPHY
H2 RECEPTOR ANTAGONISTS, 1795*
INTESTINE, SMALL
ULCER, 2601
JAUNDICE
HYPERSENSITIVITY, 2367
STEROIDS, 2367
LIPIDS
PEROXIDATION, 1896*
LIVER CIRRHOSIS
ALPHA FETOPROTEIN, 1857*
LIVER INJURY
ANTICOAGULANTS, 2589
MAGNESIUM
DEFICIENCY, 2435*
POTASSIUM
DEFICIENCY, 2435*
SECRETION
GASTRIN, 1795*, 1805*
STOMACH
HYPERTROPHY, 1795*
ULCER, 1830, 1831, 2601

DRUG-INDUCED (continued)
STOMACH DISEASES
ANTIHYPERTENSIVE AGENTS, 2134
VOMITING, 1752*

DRUG METABOLISM
ENZYMES
DIETARY FACTORS, 1957
FATS, 1957
LIVER
ALCOHOLS, 1890*
DIETARY FACTORS, 1891*, 1957
ENZYMES, 1957
FATS, 1957
TOXICITY, 1913
UREMIA, 1892*
LIVER CIRRHOSIS, 2461

DRUG THERAPY
BILE ACIDS AND SALTS
REVIEW, 2588
BILIARY TRACT
BACTERIAL INFECTIONS, 2509
CHOLELITHIASIS
BILE ACIDS AND SALTS, 2534, 2536, 2588
CHENODEOXYCHOLIC ACID, 2493, 2513, 2522, 2533, 2536
TERPENES, 2511
COLITIS
ANTIBIOTICS, 1984*
DRUG-INDUCED, 1984*
COLITIS, ULCERATIVE
ENEMA, 2295
METABOLISM, 2289*
COMMON BILE DUCT CALCULI, 2512
DIARRHEA
CHILD, 2555
DUODENUM
ULCER, PEPTIC, 2169*, 2192, 2198
DYSENTERY
ANTIBIOTICS, 2566
ENTEROCOLITIS, 2558
ESOPHAGITIS
ANTACIDS, 2065*
ESOPHAGEAL REFLUX, 2065*
ESOPHAGUS
REFLUX, 2106
SCLERODERMA, 2106
FATTY LIVER, 2427
GALLBLADDER
BACTERIAL INFECTIONS, 2509
GALLBLADDER DISEASES, 2487
HEPATITIS, 2378, 2394
CHILD, 2376, 2377
IMMUNOLOGY, 2377
HEPATITIS, INFECTIOUS, 2378, 2394
CHILD, 2376, 2377
IMMUNOLOGY, 2377
HIATAL HERNIA
ENDOSCOPY, 2097
INTESTINE, SMALL
BACTERIAL INFECTIONS, 2581
JAUNDICE, OBSTRUCTIVE
VITAMIN K, 2516
LIVER
NEOPLASMS, MALIGNANT, 2333*
LIVER CIRRHOSIS, 2444, 2446, 2461

DRUG THERAPY (continued)
LIVER COMA
HORMONES, ADRENAL CORTEX, 2424
STEROIDS, 2424
LIVER DISEASES, 2342
IMMUNOSUPPRESION, 2340
VITAMIN K, 2516
LIVER DISEASES, ALCOHOLIC
HORMONES, ADRENAL CORTEX, 2424
STEROIDS, 2424
PANCREATIC DISEASES
ANTACIDS, 2305*
ENZYMES, 2305*
H2 RECEPTOR ANTAGONISTS, 2305*
PORPHYRIA, 2354
SALMONELLOSIS
ANTIBIOTICS, 2576
CHILD, 2576
STOMACH
BLEEDING, 1842
ULCER, PEPTIC, 1842, 2181
STOMACH DISEASES
H2 RECEPTOR ANTAGONISTS, 1842
ULCER, PEPTIC, 1836
H2 RECEPTOR ANTAGONISTS, 1842, 2176, 2192
PROSTAGLANDINS, 2171*
RECURRENCE, 2194
SERUM, 1990

DRUG TOXICITY
FOOD
METABOLISM, 1915

DUBIN-JOHNSON SYNDROME
SEE JAUNDICE, CHRONIC IDIOPATHIC

DUMPING SYNDROME
GASTRECTOMY
COMPLICATIONS, 2114, 2144
PREVENTION
DIET, 2116
STOMACH
SURGERY, 2114

DUODENITIS
ABSORPTION
IRON, 2157
ANEMIA, 2157

DUODENUM
SEE ALSO INTESTINE, SMALL
ANOMALY, CONGENITAL
OBSTRUCTION, 2206*
PROGNOSIS, 2206*
BILE ACIDS AND SALTS
DIETARY FACTORS, 1970
NEONATE, 1970
ENDOTOXINS, 1966*
ENTEROPEPTIDASE
TECHNIQUES, 1975
GASTRIN
FEEDING, 1801*
ION TRANSPORT
ALCOHOLS, 1707*
BILE, 1707*
CHLORIDES, 1713*
DRUG EFFECTS ON, 1707*
STRESS, 1807*

DUODENUM (continued)
MOTILITY
NERVOUS CONTROL, 1773*
MUSCLES
NERVOUS CONTROL, 1773*
NEOPLASMS, BENIGN, 2207
NEOPLASMS, MALIGNANT
DISEASES ASSOCIATED WITH, 2490
OBSTRUCTION
PROGNOSIS, 2206*
POLYPS, 2207
RADIOLOGY
MUSCLE RELAXANTS, 2142
TECHNIQUES, 2051, 2142
REFLUX, 1775
SECRETION
GASTRIN, 1801*
SURGERY
COMPLICATIONS, 2117
TRANSPLANTATION, 1986*
TRANSPORT
BICARBONATES, 1713*
CHLORIDES, 1713*
ELECTROLYTES, 1707*
IRON, 1734
ULCER
DRUG-INDUCED, 1805*
STRESS, 1807*
ULCER, PEPTIC
ACID SECRETION, 2165*, 2187, 2188
ANTRECTOMY, 2189
CHILD, 2118
COMPLICATIONS, 2192
DISEASES ASSOCIATED WITH, 2128, 2155
DRUG THERAPY, 2169*, 2192, 2198
ENDOSCOPY, 2128
H2 RECEPTOR ANTAGONISTS, 2198
PERFORATION, 2179, 2192
PROSTAGLANDINS, 2199
RECURRENCE, 2185
SECRETIN, 1980
SURVIVAL, 2178
VAGOTOMY, 2182, 2184, 2185, 2187, 2189
VITAMIN B6
CELIAC DISEASE, 2230

DYSENTERY
ANTIBODIES, 2567
CHILD
ETIOLOGY, 2568
COLITIS
ETIOLOGY, 2569
DRUG THERAPY
ANTIBIOTICS, 2566
ETIOLOGY
BACTERIAL INFECTIONS, 2565
IMMUNOTHERAPY, 2566
INTESTINE, LARGE
MORPHOLOGY, 2569
ULTRASTRUCTURE, 2570, 2571

DYSPHAGIA
SEE DEGLUTITION DISORDERS

DYSPLASIA
CECUM
BLEEDING, 2236*

DYSPLASIA (continued)
COLON
BLEEDING, 2236*
CIRCULATION, 2268
INTESTINE, LARGE
BLEEDING, 2236*

DYSTROPHY
FATTY LIVER, 2428
GASTRECTOMY
COMPLICATIONS, 2141

ECHINOCOCCOSIS
CYSTS
SURGERY, 2362
DIAGNOSIS
ERYTHROCYTES, 2026
HEMATOLOGY, 2026, 2036
RADIOLOGY, 2027
TECHNIQUES, 2025, 2036
LIVER
CALCIFICATION, 2352
COMPLICATIONS, 2352
CYSTS, 2352
INFECTION, 2352
PERFORATION, 2352
THERAPY, 2352

ECHOGRAPHY
SEE ULTRASONOGRAPHY

EDEMA
DRUG-INDUCED
CATHARTICS, 2599

ELECTROLYTES
DEFICIENCY
CATHARTICS, 2599
DRUG-INDUCED, 2599
DIURETICS
COMPLICATIONS, 2445
DRUG EFFECTS ON
CATHARTICS, 2599
DUODENUM
TRANSPORT, 1707*
INTESTINE, LARGE
TRANSPORT, 1708*
LIVER CIRRHOSIS
DIURETICS, 2445
TRANSPORT
HORMONE EFFECTS ON, 1708*
HORMONES, GASTROINTESTINAL, 1708*

ELECTROPHORESIS
INTESTINES
LYMPHOCYTES, 1985*
OXIDOREDUCTASES
LIVER CIRRHOSIS, 2434*

ELECTROPHYSIOLOGY
ACID SECRETION
REVIEW, 1811*
CECUM
MOTILITY, 1781
COLON
CHOLECYSTOKININ, 1757*
DRUG EFFECTS ON, 1757*
HORMONE EFFECTS ON, 1757*
PENTAGASTRIN, 1757*
PERFUSION, 1756*

ELECTROPHYSIOLOGY (continued)
ILEUM
MOTILITY, 1781
INTESTINE, LARGE
MOTILITY, 1781
INTESTINE, SMALL
MOTILITY, 1781
INTESTINES
HORMONE EFFECTS ON, 1754*
LYMPHOCYTES, 1985*
MOTILIN, 1754*
LIVER
HEPATITIS, TOXIC, 1918
MITOCHONDRIA, 1918
PANCREAS
CERULEIN, 1854*
DRUG EFFECTS ON, 1854*
POTASSIUM, 1854*
STOMACH
ACID SECRETION, 1811*
ASPIRIN, 1793*, 1794*
DRUG EFFECTS ON, 1793*, 1794*
MOTILITY, 1763*
SALICYLATES, 1794*

EMESIS
SEE VOMITING

ENDOSCOPY
BILE DUCTS
PANCREATIC DUCT, 2003*
BILIARY TRACT DISEASES, 2523
CHOLANGIOGRAPHY, 2013
DIAGNOSIS, 2013, 2478
CHOLECYSTITIS, 2128
CHOLELITHIASIS
DIAGNOSIS, 2478
COLITIS
DIAGNOSIS, 2278
COLON
INFLAMMATION, 2278
POLYPS, 2242*
TECHNIQUES, 2253
COMMON BILE DUCT, 2518
COMMON BILE DUCT CALCULI, 2483
DIAGNOSIS, 2477, 2478, 2518
THERAPY, 2529
CROHN'S DISEASE
DIAGNOSIS, 2624
DUODENUM
ULCER, PEPTIC, 2128
ESOPHAGUS
DILATATION, 2077
NEOPLASM METASTASIS, 2093
NEOPLASMS, MALIGNANT, 2093
POLYPS, 2104
STENOSIS, 2110
STRICTURE, 2109
GALLBLADDER, 2502
GASTRECTOMY
COMPLICATIONS, 2043
GASTRITIS, 2043
MORPHOLOGY, 2043
NEOPLASMS, MALIGNANT, 2043
ULCER, PEPTIC, 2043
GASTRITIS
DIAGNOSIS, 2040

ENDOSCOPY (continued)
GASTROINTESTINAL DISEASES
DIAGNOSIS, 2047
THERAPY, 2047
GASTROINTESTINAL SYSTEM, 2047
BLEEDING, 2049
HEMORRHAGE, 2034
NEOPLASMS, MALIGNANT, 2050
POLYPS, 2104
REVIEW, 2044
HIATAL HERNIA
DRUG THERAPY, 2097
THERAPY, 2097
INTESTINE, SMALL
BLEEDING, 2049
NEOPLASMS, MALIGNANT, 1994*
POLYPS, 2104
PANCREATIC DISEASES
DIAGNOSIS, 2015
PANCREATOGRAPHY, 2015
PANCREATIC DUCT
BIOPSY, 2003*
CALCULI, 2523
PANCREATOGRAPHY
TECHNIQUES, 2015
SALMONELLOSIS
TRANSMISSION, 2575
STOMACH
BLEEDING, 2049
MUCUS, 1703
NEOPLASMS, MALIGNANT, 2040
POLYPS, 2040, 2104
ULCER, PEPTIC, 2040, 2127
STOMACH DISEASES
DIAGNOSIS, 2033, 2040
TECHNIQUES
ATROPINE, 2048
GLUCAGON, 2048
ULCER, PEPTIC
HEMORRHAGE, 2190
VATER'S AMPULLA
NEOPLASMS, MALIGNANT, 2523
STENOSIS, 2523

ENDOTOXINS
BILE CANALICULI
ADENOSINE TRIPHOSPHATASE, 1901*
CHOLESTASIS
ADENOSINE TRIPHOSPHATASE, 1901*
DUODENUM, 1966*
ILEUM, 1966*
INTESTINE, SMALL, 1966*
INTESTINES
CIRCULATION, 2579
JEJUNUM, 1966*
ULCER, PEPTIC
COMPLICATIONS, 2131

ENEMA
COLITIS, ULCERATIVE
DRUG THERAPY, 2295

ENTERECTOMY
BREATH TEST, 1995*
HYPERCHLORHYDRIA, 1815*
MITOSIS, 1695*
STOMACH
SECRETION, 1838

ENTERITIS
COMPLICATIONS
BACTERIAL INFECTIONS, 2560
SEPSIS, 2560
ETIOLOGY
BACTERIA, 2612
HYPOGAMMAGLOBULINEMIA
ETIOLOGY, 2203*
IMMUNOLOGY, 2203*
INFANT
DIET, 2559
INTESTINE, SMALL
ION TRANSPORT, 1697*
INTESTINES
CARCINOID TUMOR, 2202*
JEJUNUM
ION TRANSPORT, 1697*
NECROSIS
BACTERIAL INFECTIONS, 2560
COMPLICATIONS, 2560
SEPSIS, 2560
PEPTIDASE, 2561
VIRUSES
ION TRANSPORT, 1697*

ENTERITIS, REGIONAL
SEE ALSO CROHN'S DISEASE

ENTEROCOLITIS
DRUG THERAPY, 2558
ISCHEMIA
MORPHOLOGY, 2274
YERSINIA
ANTIGENS, 2580
BIOCHEMISTRY, 2580
GEOGRAPHICAL FACTORS, 2580

ENTEROCOLITIS, NECROTIZING
COMPLICATIONS
BACTERIAL INFECTIONS, 2560
SEPSIS, 2560

ENTEROKINASE
MALABSORPTION SYNDROMES
DEFICIENCY, 2234

ENTEROPEPTIDASE
DUODENUM
TECHNIQUES, 1975

ENTEROTOXINS
DIARRHEA
CLOSTRIDIUM, 2545*
FOOD POISONING
CLOSTRIDIUM, 2545*
INTESTINES
CHOLERA, 1728*
WATER, ELECTROLYTE BALANCE, 1728*

EOSINOPHILS
FASCIOLIASIS, 2616*

EPINEPHRINE
METABOLISM
NEUROMUSCULAR DISEASES, 2124
SECRETION
GASTRIN, 1822
SERUM
GASTRIN, 1822

EPINEPHRINE (continued)
STOMACH
NEUROMUSCULAR DISEASES, 2124

ERYTHROCYTES
ECHINOCOCCOSIS
DIAGNOSIS, 2026
HEPATITIS
CHILD, 2385
HEPATITIS, INFECTIOUS
CHILD, 2385
METABOLISM
LIVER DISEASES, 2326*

ESCHERICHIA COLI
DIARRHEA
SIMULATION, 1967*
GASTROENTERITIS
THERAPY, 2613, 2614
INTESTINES
BACTERIAL INFECTIONS, 2572
GASTROENTERITIS, 2597
MILK
IMMUNOGLOBULINS, 2613, 2614

ESOPHAGEAL DISEASES
INFANT
DIAGNOSIS, 2055
MOTILITY
DIAGNOSIS, 2054
RADIOLOGY, 2054
SPHINCTER
INFANT, 2055
SURGERY
ESOPHAGUS, ARTIFICIAL, 2079
PROGNOSIS, 2107
THERAPY
ESOPHAGUS, ARTIFICIAL, 2079

ESOPHAGEAL REFLUX
ACIDITY
CHILD, 2059*
TECHNIQUES, 2059*
BARRETT'S SYNDROME
SURGERY, 2086
DIAGNOSIS, 2101
CONTRAST MEDIA, 2076
DISEASES ASSOCIATED WITH
CHILD, 2103
DRUG EFFECTS ON, 2071
ESOPHAGITIS
ANTACIDS, 2065*
DRUG THERAPY, 2065*
SURGERY, 2100
ESOPHAGUS
BIOPSY, 1701
MITOSIS, 2066*
MORPHOLOGY, 1701, 2070*
MORPHOMETRY, 2066*, 2070*
PATHOLOGY, 1701
FEEDING, 2072*
SMOKING, 1751*
STOMACH
SURGERY, 2145
STRICTURE
REVIEW, 2108
SURGERY, 2108
SURGERY, 2064*
COMPLICATIONS, 2067*, 2102

ESOPHAGEAL REFLUX (continued)
SURGERY (continued)
MANOMETRY, 2068*
REVIEW, 2100
TECHNIQUES, 2067*
THERAPY, 2064*, 2085, 2101

ESOPHAGITIS
DRUG THERAPY
ANTACIDS, 2065*
ESOPHAGEAL REFLUX
ANTACIDS, 2065*
DRUG THERAPY, 2065*
SURGERY, 2100
ESOPHAGUS
MITOSIS, 2066*
MORPHOMETRY, 2066*
KIDNEYS
TRANSPLANTATION, 2541*
SURGERY
PROGNOSIS, 2107

ESOPHAGUS
ACHALASIA
DIAGNOSIS, 2060*, 2082
INFANT, 2060*
MOTILITY, 2083
RADIOLOGY, 2082
THERAPY, 2060*
ACIDITY
CHILD, 2059*
ANOMALY, CONGENITAL
ACHALASIA, 2060*
ATRESIA
MANOMETRY, 2061*
SURGERY, 2084, 2085
BARRETT'S SYNDROME
GASTRIN, 2062*
MITOSIS, 2088
PRECANCEROUS CONDITIONS, 2087
REFLUX, 2086
BIOPSY
ESOPHAGEAL REFLUX, 1701
CYSTS
DIAGNOSIS, 2094
PROGNOSIS, 2094
RADIOLOGY, 2094
DILATATION
ENDOSCOPY, 2077
FISTULA
MANOMETRY, 2061*
HEALING
RADIATION EFFECTS ON, 1700
RADIOTHERAPY, 1700
HEMORRHAGE
HYPERTENSION, PORTAL, 2458
LIVER CIRRHOSIS, 2455
SURGERY, 2551
MANOMETRY
TECHNIQUES, 1744*, 1745*
MITOSIS
ESOPHAGEAL REFLUX, 2066*
ESOPHAGITIS, 2066*
MORPHOLOGY
ESOPHAGEAL REFLUX, 1701, 2070*
RADIATION EFFECTS ON, 1700
SURGERY, 1700
MORPHOMETRY
ESOPHAGEAL REFLUX, 2066*, 2070*
ESOPHAGITIS, 2066*

ESOPHAGUS (continued)
MOTILITY
AGE FACTORS, 1750*, 2075
DEGLUTITION, 1746*
HORMONE EFFECTS ON, 1747*, 1774
HORMONES, GASTROINTESTINAL, 1774
MUSCLES, 1749*
NERVOUS CONTROL, 1749*
PREGNANCY, 1747*
PRESSURE STUDY, 1748*
RADIOISOTOPES, 2083
SECRETIN, 1774
SMOKING, 1751*
TECHNIQUES, 2083
MUSCLES
MORPHOLOGY, 2075
MYCOSES
IMMUNITY, 2089
NEOPLASM METASTASIS
ENDOSCOPY, 2093
PATHOLOGY, 2093
NEOPLASMS, BENIGN
DIAGNOSIS, 2094, 2095
PROGNOSIS, 2094
RADIOLOGY, 2094, 2095
NEOPLASMS, MALIGNANT
DEGLUTITION DISORDERS, 2063*, 2092
DIAGNOSIS, 2091
ENDOSCOPY, 2093
EPIDEMIOLOGY, 2090, 2091
PATHOLOGY, 2093
STENOSIS, 2110
SURGERY, 2063*
THERAPY, 2063*
PATHOLOGY
ESOPHAGEAL REFLUX, 1701
PERISTALSIS, 1746*
POLYPS
DIAGNOSIS, 2094
ENDOSCOPY, 2104
PROGNOSIS, 2094
RADIOLOGY, 2094
THERAPY, 2104
PRESSURE STUDY
TECHNIQUES, 2099
PROLAPSE, 2125
REFLUX
DRUG THERAPY, 2106
REGENERATION
RADIATION EFFECTS ON, 1700
RADIOTHERAPY, 1700
RUPTURE
THERAPY, 2105
SCLERODERMA
DRUG THERAPY, 2106
REFLUX, 2106
SPASM
MANOMETRY, 2073*
SURGERY, 2073*
THERAPY, 2073*
SPHINCTER
ATRESIA, 2061*
FISTULA, 2061*
HORMONE EFFECTS ON, 1747*, 1774
MANOMETRY, 1744*
MOTILITY, 1744*, 1746*, 1748*, 1750*, 1774
PREGNANCY, 1747*
PRESSURE STUDY, 1748*, 1750*, 2099

ESOPHAGUS (continued)
SPHINCTER (continued)
SMOKING, 1751*
STENOSIS
DILATATION, 2110
ENDOSCOPY, 2110
STRICTURE
DILATATION, 2077, 2109
ENDOSCOPY, 2109
PROGNOSIS, 2107
REFLUX, 2108
REVIEW, 2108
SURGERY, 2107, 2108
THERAPY, 2109
SURGERY
COMPLICATIONS, 2081, 2085
LIVER FUNCTION TESTS, 2074*
RESPIRATORY SYSTEM, 2078
TECHNIQUES, 2074*, 2080
ULCER
CHLORIDES, 2601
DRUG-INDUCED, 2601
POTASSIUM, 2601
VARICES
HEMORRHAGE, 2458
HYPERTENSION, PORTAL, 2458
SURGERY, 2074*
THERAPY, 2074*

ESOPHAGUS, ARTIFICIAL
COLON
ACIDS, 1982
ESOPHAGEAL DISEASES
SURGERY, 2079
THERAPY, 2079
TECHNIQUES, 2079, 2080

ESTROGENS
BILE
EXCRETION, 1887*
BILE ACIDS AND SALTS
BINDING, 1902*
INTESTINES
HORMONE EFFECTS ON, 1978
LIVER
ADENOSINE TRIPHOSPHATASE, 1902*
ULTRASTRUCTURE, 1902*
LIVER FUNCTION TESTS
DRUG EFFECTS ON, 2603

EXCRETION
ALPHA FETOPROTEIN, 1897*
BILE
ESTROGENS, 1887*
BILE ACIDS AND SALTS
APPETITE DEPRESSANTS, 1992
DRUG EFFECTS ON, 1992
FATS
APPETITE DEPRESSANTS, 1992
DRUG EFFECTS ON, 1992
STEROLS
APPETITE DEPRESSANTS, 1992
DRUG EFFECTS ON, 1992

FASCIOLIASIS
DIAGNOSIS, 2616*
EOSINOPHILS, 2616*
TRANSMISSION, 2616*

FATS
SEE ALSO LIPIDS, TRIGLYCERIDES
CYSTIC FIBROSIS
ABSORPTION, 2303*
DRUG METABOLISM
ENZYMES, 1957
EXCRETION
APPETITE DEPRESSANTS, 1992
DRUG EFFECTS ON, 1992
INTESTINAL ABSORPTION
INFANT, 1726*
MORPHOLOGY, 1724*
STOMACH, 1736
INTESTINE, LARGE
ABSORPTION, 1724*
JEJUNUM
ACID SECRETION, 1837
LIVER
DRUG METABOLISM, 1957
FATTY ACIDS, 1957
LYMPHATIC SYSTEM
TRANSPORT, 1725*
PANCREAS
SECRETION, 1839
SECRETION
GASTRIN, 1839
STOMACH
ACID SECRETION, 1837, 1839, 2172*
SECRETION, 1838

FATTY ACIDS
COLON
TRANSPORT, 1737
INTESTINAL ABSORPTION, 1737
WATER, 1731
LIVER
DIETARY FACTORS, 1957
FATS, 1957
PANCREAS
BICARBONATE SECRETION, 1861*

FATTY LIVER
DRUG THERAPY, 2427
DYSTROPHY, 2428
HEPATITIS, INFECTIOUS, 2428
LIVER
TRIGLYCERIDES, 1951
PARENTERAL ALIMENTATION
GLUCOSE, 1951
SECRETION
LIPOPROTEINS, 1947
SHUNT, INTESTINAL
COMPLICATIONS, 2220
THERAPY
VITAMIN B12, 2427

FECES
CARBOHYDRATES, 2598
COLONIC DISEASES
DIAGNOSIS, 2543*
DIARRHEA
DIAGNOSIS, 2543*
LEUKOCYTES, 2543*
DISACCHARIDASES
DEFICIENCY, 2598
LIPIDS
DIETARY FACTORS, 2482
FIBERS, 2482

FECES (continued)
NEOPLASMS
BLOOD, 2237*
DIAGNOSIS, 2237*
PANCREAS FUNCTION TESTS
CHYMOTRYPSIN, 2307

FEEDING
ANTRUM
GASTRIN, 1801*
DUODENUM
GASTRIN, 1801*
ESOPHAGEAL REFLUX, 2072*
NUCLEIC ACIDS
SYNTHESIS, 1862*
PANCREAS
PRESSURE STUDY, 1864*
SECRETION, 1864*
PLASMA
SECRETIN, 1980
SECRETION
GASTRIN, 1801*
STOMACH
GASTRIN, 1801*
ULCER, PEPTIC
SECRETIN, 1980
ZOLLINGER-ELLISON SYNDROME
SECRETIN, 1980

FETOPROTEIN, ALPHA
SEE ALPHA FETOPROTEIN

FETUS
BILE ACIDS AND SALTS, 1920
HEPATOCYTES
GLYCOLYSIS, 1954
INTESTINE, SMALL
ENZYMES, 1964*
LIVER, 1920
GLYCOLYSIS, 1954

FIBERS
FECES
LIPIDS, 2482
SERUM
LIPIDS, 2482

FIBROSIS
LIVER
DISEASES ASSOCIATED WITH, 2350
GENETIC FACTORS, 2350
KIDNEY DISEASES, 2350
SHUNT, INTESTINAL, 2219

FISTULA
BILIARY TRACT, 2508
DIAGNOSIS, 2024
RADIOLOGY, 2024
ESOPHAGUS
MANOMETRY, 2061*
SPHINCTER, 2061*
GASTROINTESTINAL SYSTEM
DIAGNOSIS, 2024
RADIOLOGY, 2024
ILEOSTOMY
COMPLICATIONS, 2215
ILEUM
AMNIOCENTESIS, 2209

FISTULA (continued)
PANCREAS
ASCITES, 2441
CHILD, 2441
HEMORRHAGE, 2441

FLUID BALANCE
SEE WATER, ELECTROLYTE BALANCE

FOOD
DRUG TOXICITY
METABOLISM, 1915
INTESTINE, SMALL
ENZYMES, 1973
MORPHOLOGY, 1973
PARASYMPATHOLYTICS, 1789
STOMACH
ENZYMES, 1973
MORPHOLOGY, 1973
MOTILITY, 1761*, 1762*

FOOD POISONING
CLOSTRIDIUM
DIAGNOSIS, 2545*
ENTEROTOXINS, 2545*
INTESTINES
CIRCULATION, 2584
THERAPY, 2584

FRUCTOSE
MALABSORPTION SYNDROMES
DIAGNOSIS, 2031

FUNGUS DISEASES
SEE MYCOSES

GALLBLADDER
ANOMALY, 2504
BACTERIAL INFECTIONS, 2510
ANTIBACTERIALS, 2509
DRUG THERAPY, 2509
BILE
CHEMICAL COMPOSITION, 2479
ENDOSCOPY, 2502
LIPIDS
ETHNIC FACTORS, 2489
MOTILITY
ANALGESICS AND ANTIPYRETICS, 1785
ANTI-INFLAMMATORY AGENTS, 1785
DRUG EFFECTS ON, 1771*, 1785
HORMONE EFFECTS ON, 1772*
HORMONES, GASTROINTESTINAL, 1772*
SURGERY
COMPLICATIONS, 2510

GALLBLADDER DISEASES
BILE
CHEMICAL COMPOSITION, 2479
COLON
RADIOLOGY, 2501
DIAGNOSIS
CHOLECYSTOGRAPHY, 2032
RADIOLOGY, 2032
TECHNIQUES, 2032
TOMOGRAPHY, 2032
DISEASES ASSOCIATED WITH
COLON, 2501
DRUG THERAPY, 2487

GALLSTONES
CHEMICAL COMPOSITION, 2485
ENZYMES, 2488
WATER, 2484

GANGRENE
COLON
INFARCTION, 2269
NEOPLASMS, MALIGNANT, 2269
SURGERY, 2269
GASTROINTESTINAL SYSTEM
HEMORRHAGE, 2210
INTESTINES
ISCHEMIA, 2210

GASTRECTOMY
ABSORPTION
CARBOHYDRATES, 2154
COMPLICATIONS, 2115, 2135, 2136, 2138
DIAGNOSIS, 2043
DIARRHEA, 2154
DUMPING SYNDROME, 2114, 2144
DYSTROPHY, 2141
ENDOSCOPY, 2043
NUTRITION DISORDERS, 2153
ULCER, PEPTIC, 2144
DIARRHEA
POLYSACCHARIDES, 2154
PREVENTION, 2154
GASTRITIS
DIAGNOSIS, 2043
ENDOSCOPY, 2043
HYPERCHLORHYDRIA, 1815*
JEJUNUM
ULCER, PEPTIC, 2144
MALABSORPTION SYNDROMES
IATROGENESIS, 2120
MORPHOLOGY
ENDOSCOPY, 2043
NEOPLASMS, MALIGNANT
COMPLICATIONS, 2149
DIAGNOSIS, 2043
ENDOSCOPY, 2043
NITROGEN
METABOLISM, 2119
PROTEINS
METABOLISM, 2119
REVIEW, 2146
STOMACH
NEOPLASMS, MALIGNANT, 2149
TECHNIQUES, 2115, 2135, 2137
ULCER, PEPTIC
DIAGNOSIS, 2043
ENDOSCOPY, 2043
RECURRENCE, 2194

GASTRIC INHIBITORY POLYPEPTIDE
SEE HORMONES, GASTROINTESTINAL

GASTRIN
ANTRUM
CELLS, 1799*
FEEDING, 1801*
MITOSIS, 1803*
NUCLEIC ACIDS, 1803*
SECRETION, 1801*
BILIARY TRACT, 1800*

GASTRIN (continued)
CELLS
HYPERPLASIA, 1797*
TISSUE CULTURE, 1799*
DRUG EFFECTS ON
ANTACIDS, 2168*
DUODENUM
FEEDING, 1801*
SECRETION, 1801*
ESOPHAGUS
BARRETT'S SYNDROME, 2062*
GASTROINTESTINAL SYSTEM
MITOSIS, 1803*
INTESTINE, SMALL
MITOSIS, 1803*
NUCLEIC ACIDS, 1803*
KIDNEY DISEASES
HORMONES, GASTROINTESTINAL, 2605
SECRETION, 2150
ACID SECRETION, 1824
AGE FACTORS, 1821
AMINO ACIDS, 1802*
ANTACIDS, 2168*
DIETARY FACTORS, 1823, 1839
DRUG EFFECTS ON, 1795*, 1822, 2168*
DRUG-INDUCED, 1795*, 1805*
EPINEPHRINE, 1822
FATS, 1839
FEEDING, 1801*
GLUCOSE, 1840
H2 RECEPTOR ANTAGONISTS, 1795*
HYPERCHLORHYDRIA, 1824
INFANT, 1821
NERVOUS CONTROL, 1829, 1840
SMOKING, 1859*
STRESS, 1807*
ULCER, PEPTIC, 2165*, 2168*
VAGOTOMY, 1822
SERUM
ADRENERGIC RECEPTOR AGONISTS, 1822
ADRENERGIC RECEPTOR BLOCKADERS, 1822
AGE FACTORS, 1821
ANEMIA, PERNICIOUS, 2158
ANTACIDS, 2168*
DIETARY FACTORS, 1823
DRUG EFFECTS ON, 1822, 2168*, 2198
EPINEPHRINE, 1822
H2 RECEPTOR ANTAGONISTS, 2198
INFANT, 1821
PARASYMPATHOMIMETICS, 1822
ULCER, PEPTIC, 2168*, 2198
VAGOTOMY, 1822
STOMACH, 1800*
ACID SECRETION, 1828, 1841
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 2163*
ANEMIA, PERNICIOUS, 2158
CELLS, 1798*, 1799*
FEEDING, 1801*
MITOSIS, 1824
NEOPLASMS, MALIGNANT, 2112*
NUCLEIC ACIDS, 1803*
SECRETION, 1801*, 1824, 2167*
SURGERY, 1806*
ZOLLINGER-ELLISON SYNDROME
RADIOIMMUNOASSAY, 2000*, 2058

GASTRITIS
ABSORPTION
IRON, 2157
ANEMIA, 2157
ANTRECTOMY, 2200
DIAGNOSIS
ENDOSCOPY, 2040
DISEASES ASSOCIATED WITH
ULCER, PEPTIC, 2155
DRUG-INDUCED
ANTI-INFLAMMATORY AGENTS, 1831, 1833
PREVENTION, 1833
ETIOLOGY, 2195
GASTRECTOMY
DIAGNOSIS, 2043
ENDOSCOPY, 2043
PREVENTION
H2 RECEPTOR ANTAGONISTS, 1833
ULCER, PEPTIC
SURGERY, 2195
VAGOTOMY, 2200

GASTRITIS, ATROPHIC
ANEMIA, PERNICIOUS
ETIOLOGY, 2156
REVIEW, 2156

GASTRODUODENAL ULCER
SEE ULCER, PEPTIC

GASTROENTERITIS
ESCHERICHIA COLI
THERAPY, 2613, 2614
INFANT, 2611
INTESTINE, SMALL
LYMPHOCYTES, 2600
INTESTINES
ESCHERICHIA COLI, 2597
JEJUNUM
LYMPHOCYTES, 2600
THERAPY
IMMUNOGLOBULINS, 2613, 2614

GASTROINTESTINAL DISEASES
DIAGNOSIS
ENDOSCOPY, 2047
RADIOLOGY, 2051
INTESTINE, LARGE
CIRCULATION, 2585
PANCREAS
SECRETION, 2591
RADIOLOGY
TECHNIQUES, 2051
THERAPY
ENDOSCOPY, 2047
URINE
OXALATES, 2232

GASTROINTESTINAL SYSTEM
AMYLOIDOSIS, 2606
BLEEDING
DIAGNOSIS, 2049
ENDOSCOPY, 2049
CARCINOID TUMOR, 2596
DIAGNOSIS
TECHNIQUES, 2050
ENDOSCOPY, 2047
REVIEW, 2044

GASTROINTESTINAL SYSTEM (continued)
FISTULA
DIAGNOSIS, 2024
RADIOLOGY, 2024
HEMORRHAGE, 2552
COMPLICATIONS, 2210
DIAGNOSIS, 2034
ENDOSCOPY, 2034
GANGRENE, 2210
ISCHEMIA, 2210
LIVER CIRRHOSIS, 2455
RADIOLOGY, 2034
SURGERY, 2551
HEPATITIS, INFECTIOUS
HEMORRHAGE, 2411
INFECTION
PREVENTION, 2604
MITOSIS
GASTRIN, 1803*
HORMONE CONTROL, 1803*
HORMONE EFFECTS ON, 1803*
NEOPLASMS, MALIGNANT
BIOPSY, 2050
CYTOLOGY, 2050
DIAGNOSIS, 2050, 2052
ENDOSCOPY, 2050
RADIOLOGY, 2052
POLYPS
CLASSIFICATION, 2286
ENDOSCOPY, 2104
FAMILIAL FACTORS, 2286
PRECANCEROUS CONDITIONS, 2286
THERAPY, 2104
RADIOLOGY
TECHNIQUES, 2052
RADIOTHERAPY
COMPLICATIONS, 2542*
SEPSIS
PREVENTION, 2604
SURGERY
ANTIBIOTICS, 2604
COMPLICATIONS, 2604
INFECTION, 2604
SEPSIS, 2604
ULCER
STRESS, 2132

GIARDIASIS
IMMUNOLOGY, 1987
INTESTINE, SMALL
LYMPHOCYTES, 2600, 2617*
JEJUNUM
LYMPHOCYTES, 2600, 2617*

GLOBULINS
LIVER CIRRHOSIS
DIAGNOSIS, 2438

GLUCAGON
ANUS
MOTILITY, 1759*
COLON
MOTILITY, 1759*
ENDOSCOPY
TECHNIQUES, 2048
INTESTINES
CELLS, 1851*
KIDNEY DISEASES
HORMONES, GASTROINTESTINAL, 2605

GLUCAGON (continued)
PANCREAS
CELLS, 1851*
NEOPLASMS, MALIGNANT, 2300*
RECTUM
MOTILITY, 1759*

GLUCONEOGENESIS
CLEARANCE STUDY
LIVER DISEASES, ALCOHOLIC, 2420
DRUG EFFECTS ON
VITAMIN A, 1904*
LIVER
DRUG EFFECTS ON, 1904*

GLUCOSE
FATTY LIVER
PARENTERAL ALIMENTATION, 1951
INTESTINAL ABSORPTION
CELIAC DISEASE, 1717*
DISACCHARIDES, 1735
JEJUNUM
TRANSPORT, 1717*, 1735
METABOLISM
OBESITY, 2216
SHUNT, INTESTINAL, 2216
SECRETION
GASTRIN, 1840
STOMACH
MOTILITY, 1777

GLUCOSE PHOSPHATE DEHYDROGENASE
LIVER
DIETARY FACTORS, 1952
DRUG EFFECTS ON, 1952

GLUTAMYLTRANSPEPTIDASE
LIVER
CHOLESTASIS, 2524

GLUTATHIONE
LIVER
METABOLISM, 1893*
PEROXIDATION, 1893*

GLYCOGEN
LIVER
PARENTERAL ALIMENTATION, 1953
WOUNDS AND INJURIES, 1953

GLYCOGEN STORAGE DISEASE
SEE GLYCOGENOSIS

GLYCOLYSIS
HEPATOCYTES
FETUS, 1954
LIVER
FETUS, 1954

GLYCOPROTEINS
INTESTINAL ABSORPTION, 1727*
METABOLISM
BLIND LOOP SYNDROME, 1965*
SALIVARY GLANDS
SECRETION, 1788*

GRANULOMA
LIVER
ARTERITIS, 2334*
DISEASES ASSOCIATED WITH, 2334*

GUANOSINE CYCLIC 3',5' MONOPHOSPHATE
PANCREAS, 1857*
BICARBONATE SECRETION, 1872
HORMONE EFFECTS ON, 1858*
SECRETION, 1872
STOMACH
ACID SECRETION, 1847
NEOPLASMS, MALIGNANT, 2163*
ULCER
STRESS, 1792*

H2 RECEPTOR ANTAGONISTS
ABSORPTION
DRUG EFFECTS ON, 2177
REVIEW, 1842
ACID SECRETION
DRUG EFFECTS ON, 1813*
BILE
STOMACH, 1814*
DUODENUM
ULCER, PEPTIC, 2198
GASTRITIS
PREVENTION, 1833
HEIDENHAIN POUCH
BILE, 1814*
HYPERTROPHY
DRUG-INDUCED, 1795*
INTESTINES
CIRCULATION, 1983*
MESENTERY
CIRCULATION, 1983*
METABOLISM
REVIEW, 1842
PANCREATIC DISEASES
DRUG THERAPY, 2305*
SECRETION
GASTRIN, 1795*
PEPSIN, 1813*
SERUM
GASTRIN, 2198
STOMACH
ACID SECRETION, 1795*, 1813*, 1825, 1841, 1842, 1844, 2197
BLEEDING, 1842
HYPERTROPHY, 1795*
ULCER, PEPTIC, 1842
STOMACH DISEASES
DRUG THERAPY, 1842
ULCER, PEPTIC
ABSORPTION, 2174, 2177
DRUG THERAPY, 1842, 2170*, 2176, 2192
METABOLISM, 2174
PERFORATION, 2192
RECURRENCE, 2194
UREMIA, 2170*

HAPTOGLOBINS
AUSTRALIA ANTIGEN, 2388

HEIDENHAIN POUCH
H2 RECEPTOR ANTAGONISTS
BILE, 1814*

HEMATIN
SEE HEME

HEMATOBILIA
CHOLANGITIS, 2336
DIAGNOSIS, 2491
LIVER
BIOPSY, 2336
VATER'S AMPULLA
STENOSIS, 2336

HEMATOPOIESIS
HEPATITIS, 2403
HEPATITIS, INFECTIOUS, 2403

HEME
LIVER
METABOLISM, 1886*

HEMOBILIA
SEE HEMATOBILIA

HEMOLYSIS
WILSON'S DISEASE
DIAGNOSIS, 2357

HEMORRHAGE
SEE ALSO BLEEDING
ASCITES
CHILD, 2441
ETIOLOGY, 2441
ESOPHAGUS
HYPERTENSION, PORTAL, 2458
LIVER CIRRHOSIS, 2455
SURGERY, 2551
VARICES, 2458
GASTROINTESTINAL SYSTEM, 2552
COMPLICATIONS, 2210
DIAGNOSIS, 2034
ENDOSCOPY, 2034
GANGRENE, 2210
ISCHEMIA, 2210
LIVER CIRRHOSIS, 2455
RADIOLOGY, 2034
SURGERY, 2551
HEPATITIS
CHILD, 2375
PREVENTION, 2375
HEPATITIS, INFECTIOUS
CHILD, 2375
GASTROINTESTINAL SYSTEM, 2411
PREVENTION, 2375
INTESTINE, SMALL
LIVER CIRRHOSIS, 2455
SURGERY, 2551
KIDNEYS
TRANSPLANTATION, 2541*
LIVER CIRRHOSIS
ETIOLOGY, 2455
PROGNOSIS, 2455
SURGERY, 2448
PANCREAS
FISTULA, 2441
STOMACH
LASER, 1827
LIVER CIRRHOSIS, 2455
SURGERY, 2159, 2551
SURVIVAL, 2159
THERAPY, 1827
ULCER, 1827

HEMORRHAGE (continued)
THERAPY
LASER, 1827
ULCER
LASER, 1827
THERAPY, 1827
ULCER, PEPTIC
DIAGNOSIS, 2190
ENDOSCOPY, 2190

HEMORRHOIDS
CRYOSURGERY, 2248
SURGERY, 2248
THERAPY, 2248

HEPATECTOMY
REGENERATION
STRESS, 1907*
SIMULATION
SEQUELAE, 1912
TECHNIQUES, 2362

HEPATIC VEIN THROMBOSIS
SEE ALSO BUDD-CHIARI SYNDROME

HEPATITIS
ANTIBODIES
REVIEW, 2400
ANTIGENS
REVIEW, 2400
AUSTRALIA ANTIGEN
CARRIER STATE, 2407, 2408
CHILD, 2379
REVIEW, 2399, 2400
AUTOIMMUNE DISEASES
MORPHOLOGY, 2365*
BLOOD
BILE ACIDS AND SALTS, 2383
CLOTTING, 2384
CHILD, 2381, 2386
ANGIOGRAPHY, 2373
AUSTRALIA ANTIGEN, 2390
BILE ACIDS AND SALTS, 2383
CLOTTING, 2384
DIAGNOSIS, 2373
DRUG THERAPY, 2376, 2377
ERYTHROCYTES, 2385
IMMUNITY, 2405
IMMUNOLOGY, 2382
KIDNEYS, 2374
PROGNOSIS, 2390
THERAPY, 2374, 2375
CHOLESTASIS
ETIOLOGY, 2409
CLEARANCE STUDY
SULFOBROMOPHTHALEIN, 2395
COMPLICATIONS
LIVER FUNCTION TESTS, 2395
DIAGNOSIS, 2429
DISEASES ASSOCIATED WITH
HEMOPHILIA, 2331*
DRUG THERAPY, 2378, 2394
IMMUNOLOGY, 2377
ENZYMES, 2010
EPIDEMIOLOGY, 2401
REVIEW, 2399
HEMATOLOGY, 2403
HEMATOPOIESIS, 2403

HEPATITIS (continued)
HEMORRHAGE
CHILD, 2375
PREVENTION, 2375
IMMUNOLOGY, 2406, 2464
INFECTION
ANTIBODIES, 1903*
ANTIGENS, 1903*
INTESTINAL ABSORPTION
CHILD, 2387
KIDNEYS
TRANSPLANTATION, 2541*
LIVER
MORPHOLOGY, 2365*
LIVER COMA
CHILD, 2391
THERAPY, 2391
LIVER DISEASES
MORPHOLOGY, 2365*
LIVER FUNCTION TESTS, 2010, 2417
SULFOBROMOPHTHALEIN, 2395
NECROSIS
AUSTRALIA ANTIGEN, 2390
NEONATE
SEASONAL FACTORS, 2481
THERAPY, 2392
REVIEW, 2400
TRANSFUSION, 2331*
VACCINES, 2397, 2398
VIRUSES
INFECTION, 1903*

HEPATITIS, CHRONIC
ANTIGENS, 2416
AUSTRALIA ANTIGEN
CARRIER STATE, 2408
BILE
BILE ACIDS AND SALTS, 2415
CHILD
AUSTRALIA ANTIGEN, 2390
ETIOLOGY
VIRUSES, 2418
HYPERBILIRUBINEMIA
DISEASES ASSOCIATED WITH, 2363
HYPERTENSION
LIVER CIRRHOSIS, 2412*
IMMUNOGLOBULINS, 2465
IMMUNOLOGY, 2402, 2433*
INTERFERON, 2413
LIVER CIRRHOSIS
PANCREAS, 2462, 2463
LIVER FUNCTION TESTS, 2417
PANCREAS
SECRETION, 2462, 2463

HEPATITIS, CHRONIC INTERSTITIAL
SEE LIVER CIRRHOSIS

HEPATITIS, INFECTIOUS
ANTIBODIES
REVIEW, 2400
ANTIGENS
REVIEW, 2400
AUSTRALIA ANTIGEN
CHILD, 2379
REVIEW, 2399, 2400
BLOOD
BILE ACIDS AND SALTS, 2383
CLOTTING, 2384

HEPATITIS, INFECTIOUS (continued)
CHILD, 2381, 2386
ANGIOGRAPHY, 2373
AUSTRALIA ANTIGEN, 2390
BILE ACIDS AND SALTS, 2383
CLOTTING, 2384
DIAGNOSIS, 2373
L-DOPA, 2389
DOPAMINE, 2389
DRUG THERAPY, 2376, 2377
ERYTHROCYTES, 2385
IMMUNITY, 2405
KIDNEYS, 2374
PROGNOSIS, 2390
THERAPY, 2374, 2375
CHOLESTASIS
ETIOLOGY, 2409
CLEARANCE STUDY
SULFOBROMOPHTHALEIN, 2395
COMPLICATIONS
LIVER FUNCTION TESTS, 2395
DIAGNOSIS, 2429
L-DOPA
METABOLISM, 2389
DOPAMINE
METABOLISM, 2389
DRUG THERAPY, 2378, 2394
IMMUNOLOGY, 2377
EPIDEMIOLOGY, 2401
REVIEW, 2399
FATTY LIVER, 2428
GASTROINTESTINAL SYSTEM
HEMORRHAGE, 2411
GENETIC FACTORS, 1958
HEMATOLOGY, 2403
HEMATOPOIESIS, 2403
HEMORRHAGE
CHILD, 2375
PREVENTION, 2375
IMMUNOLOGY, 2406
INTESTINAL ABSORPTION
CHILD, 2387
LIVER COMA
CHILD, 2391
THERAPY, 2391
LIVER FUNCTION TESTS
SULFOBROMOPHTHALEIN, 2395
NECROSIS
AUSTRALIA ANTIGEN, 2390
PHYSICAL ACTIVITY
HUMORAL FACTORS, 2396
THERAPY, 2392
REVIEW, 2400

HEPATITIS, NONVIRAL
DRUG-INDUCED
ANESTHETICS, 2371
ANTI-ARRHYTHMIA AGENTS, 2369
ANTICONVULSANTS, 2368
HYPERSENSITIVITY, 2367
IMMUNOLOGY, 2370
STEROIDS, 2367

HEPATITIS, SERUM
CHILD
IMMUNOLOGY, 2382
EPIDEMIOLOGY, 2401

HEPATITIS, SERUM (continued)
INFECTION
ANTIBODIES, 1903*
ANTIGENS, 1903*
TRANSFUSION, 2331*
VIRUSES
INFECTION, 1903*

HEPATITIS, TOXIC
CARBON TETRACHLORIDE
OXYGEN, 1962
LIVER
ELECTROPHYSIOLOGY, 1918

HEPATITIS, VIRAL
SEE HEPATITIS, INFECTIOUS

HEPATOCYTES
BIOCHEMISTRY, 1879*
GLYCOLYSIS
FETUS, 1954
ISOLATION
TECHNIQUES, 1879*
LIPIDS
SYNTHESIS, 1943
LIPOGENESIS
ULTRASTRUCTURE, 1949
LIPOPROTEINS
ULTRASTRUCTURE, 1949
MORPHOLOGY, 1879*
SECRETION
BILE ACIDS AND SALTS, 1884*
TRANSPORT
BILE ACIDS AND SALTS, 1885*

HEPATOLENTICULAR DEGENERATION
SEE WILSON'S DISEASE

HIATAL HERNIA
DIAGNOSIS
CONTRAST MEDIA, 2076
DRUG THERAPY
ENDOSCOPY, 2097
STOMACH
MOTILITY, 2069*
SURGERY, 2096
COMPLICATIONS, 2067*
MANOMETRY, 2068*, 2098
PROGNOSIS, 2107
RECURRENCE, 2098
REVIEW, 2100
TECHNIQUES, 2067*, 2098
THERAPY, 2096
ENDOSCOPY, 2097

HIRSCHSPRUNG'S DISEASE
SEE ALSO MEGACOLON
MEGACOLON, 2280

HISTAMINE
ACID SECRETION
DRUG EFFECTS ON, 1813*
SOMATOSTATIN, 1810*
ANTRUM
ULCER, 1830
INTESTINES
CIRCULATION, 1983*
MESENTERY
CIRCULATION, 1983*

HISTAMINE (continued)
SECRETION
PEPSIN, 1813*
STOMACH
ACID SECRETION, 1813*, 1841, 1843, 1844
ADENYL CYCLASE, 1845
ULCER, 1830

HORMONE CONTROL
ANTRUM
MITOSIS, 1803*
GASTROINTESTINAL SYSTEM
MITOSIS, 1803*
INTESTINE, SMALL
MITOSIS, 1803*
PANCREAS
BICARBONATE SECRETION, 1871, 1873
ION TRANSPORT, 1855*
SECRETION, 1839, 1855*, 1869, 1873, 1874
PANCREATIC DUCT
BICARBONATE SECRETION, 1856*
SECRETION, 1856*
SECRETION
AMYLASES, 1874
STOMACH
ACID SECRETION, 1839
MOTILIN, 1765*, 1766*
MOTILITY, 1764*, 1765*, 1766*

HORMONES
CELIAC DISEASE
SECRETION, 2227
LIVER DISEASES, 2340
PANCREAS, 1868, 1870
PANCREATITIS, CHRONIC, 2320

HORMONES, ADRENAL CORTEX
LIVER COMA
DRUG THERAPY, 2424
THERAPY, 2424
LIVER DISEASES, ALCOHOLIC
DRUG THERAPY, 2424
THERAPY, 2424
SECRETION
LIPASE, 1852*
PROTEINS, 1852*

HORMONES, GASTROINTESTINAL
DIARRHEA, 2564
ESOPHAGUS
MOTILITY, 1774
GALLBLADDER
MOTILITY, 1772*
INTESTINAL ABSORPTION
SODIUM, 1738
WATER, 1738
INTESTINE, LARGE
ION TRANSPORT, 1708*
INTESTINES
ION TRANSPORT, 1738
ISOLATION, 1977
KIDNEY DISEASES
CHOLECYSTOKININ, 2605
GASTRIN, 2605
GLUCAGON, 2605
NEOPLASMS, 2564

HORMONES, GASTROINTESTINAL (continued)
NEOPLASMS, MALIGNANT
DIARRHEA, 2563
PANCREATITIS, CHRONIC, 2320
SALIVARY GLANDS
ION TRANSPORT, 1743
TRANSPORT, 1743
STOMACH
ACID SECRETION, 1846
MOTILITY, 1764*
TRANSPORT
ELECTROLYTES, 1708*

HYPERBILIRUBINEMIA
DISEASES ASSOCIATED WITH
HEPATITIS, CHRONIC, 2363
LIPOLYSIS, 1946
PHOTOTHERAPY
TECHNIQUES, 1905*

HYPERCALCEMIA
STOMACH
NEOPLASMS, MALIGNANT, 1797*

HYPERCHLORHYDRIA
SEE ALSO SECRETION
ENTERECTOMY, 1815*
GASTRECTOMY, 1815*
SECRETION
GASTRIN, 1824
STOMACH
MITOSIS, 1824

HYPERLIPEMIA
PANCREATITIS
COMPLICATIONS, 2314
PANCREATITIS, CHRONIC
COMPLICATIONS, 2314

HYPERPLASIA
GASTRIN
CELLS, 1797*

HYPERSENSITIVITY
ALCOHOLISM
ANTIGENS, 2425
HEPATITIS, NONVIRAL
DRUG-INDUCED, 2367
JAUNDICE
DRUG-INDUCED, 2367

HYPERTENSION
HEPATITIS, CHRONIC
LIVER CIRRHOSIS, 2412*

HYPERTENSION, PORTAL
BLOOD
CLOTTING, 2459
CHILD
ANGIOGRAPHY, 2442
DIAGNOSIS, 2442
DIAGNOSIS, 2456
ANGIOGRAPHY, 2442
ESOPHAGUS
HEMORRHAGE, 2458
VARICES, 2458
LIVER
MORPHOLOGY, 2460

HYPERTENSION, PORTAL (continued)
LIVER CIRRHOSIS
MORPHOLOGY, 2460
PORTACAVAL SHUNT, 2450
SURGERY, 2449
PORTACAVAL SHUNT
CIRCULATION, 2454
SURGERY, 2451
COMPLICATIONS, 2355
PROGNOSIS, 2355
THERAPY, 2456

HYPERTROPHY
DRUG-INDUCED
H2 RECEPTOR ANTAGONISTS, 1795*
PYLORUS
DIAGNOSIS, 2126
STENOSIS, 2126
SURGERY, 2126
THERAPY, 2126
STOMACH
DRUG-INDUCED, 1795*
H2 RECEPTOR ANTAGONISTS, 1795*

HYPOPLASIA
BILIARY TRACT
NEONATE, 2476*
SURGERY, 2476*

HYPOXIA
AMINO ACIDS
METABOLISM, 1950
LIVER
OXYGEN, 1889*
LIVER INJURY
DIET, 1950
PROTEINS, 1950
PROTEINS
METABOLISM, 1950

ICTERUS
SEE JAUNDICE

ILEITIS
COLITIS, ULCERATIVE
COMPLICATIONS, 2296
HYPOGAMMAGLOBULINEMIA
ETIOLOGY, 2203*
IMMUNOLOGY, 2203*
ILEOSTOMY
COMPLICATIONS, 2215

ILEOSTOMY
BREATH TEST, 1995*
COMPLICATIONS
FISTULA, 2215
ILEITIS, 2215
PREVENTION, 2215
THERAPY, 2215

ILEUM
SEE ALSO INTESTINE, SMALL
AMINO ACIDS
PARENTERAL ALIMENTATION, 1968
ANOMALY
AMNIOCENTESIS, 2209
ATRESIA
AMNIOCENTESIS, 2209

ILEUM (continued)
COLITIS, ULCERATIVE
COMPLICATIONS, 2296
ENDARTERITIS
RADIATION, 2610
ENDOTOXINS, 1966*
FISTULA
AMNIOCENTESIS, 2209
MEGACOLON
VALVE, 2273
MOTILITY
ELECTROPHYSIOLOGY, 1781
NERVOUS CONTROL, 1755*
PROSTAGLANDINS, 1755*
NERVOUS CONTROL
PROSTAGLANDINS, 1755*
RADIATION EFFECTS ON, 2610

ILEUS
SEE INTESTINAL OBSTRUCTION

IMMUNITY
ESOPHAGUS
MYCOSES, 2089
HEPATITIS
CHILD, 2405
HEPATITIS, INFECTIOUS
CHILD, 2405

IMMUNOGLOBULINS
DERMATITIS HERPETIFORMIS, 2546*
GASTROENTERITIS
THERAPY, 2613, 2614
HEPATITIS, CHRONIC, 2465
INTESTINE, SMALL
BINDING, 1719*
CELIAC DISEASE, 2229
TRANSPORT, 1719*
ULTRASTRUCTURE, 2229
LIVER CIRRHOSIS, 2465
DIAGNOSIS, 2438
LIVER DISEASES, 2465
DIAGNOSIS, 2344
MILK
ESCHERICHIA COLI, 2613, 2614
OXIDOREDUCTASES
BINDING, 2434*

IMMUNOSUPPRESION
LIVER DISEASES
DRUG THERAPY, 2340

IMMUNOTHERAPY
DYSENTERY, 2566

INCONTINENCE
ANORECTUM
PRESSURE STUDY, 1782
CHILD
PREVENTION, 2271
RECTUM
PREVENTION, 2271, 2272
SURGERY, 2272

INDOCYANINE GREEN
BILIARY TRACT DISEASES
CLEARANCE STUDY, 2029
CHOLESTASIS
DIAGNOSIS, 2539

INDOCYANINE GREEN (continued)
LIVER DISEASES
CLEARANCE STUDY, 2029
LIVER FUNCTION TESTS
CLEARANCE STUDY, 2539
METABOLISM, 2539

INFANT
ANORECTUM
PRESSURE STUDY, 1782
CHOLESTASIS, 2526
DIAGNOSIS, 2528
COLON
RADIOLOGY, 2041
DEGLUTITION DISORDERS
ACHALASIA, 2060*
ENTERITIS
DIET, 2559
ESOPHAGEAL DISEASES
DIAGNOSIS, 2055
SPHINCTER, 2055
ESOPHAGUS
ACHALASIA, 2060*
GASTROENTERITIS, 2611
INTESTINAL ABSORPTION
FATS, 1726*
JAUNDICE, 2526
DIAGNOSIS, 2528
JAUNDICE, OBSTRUCTIVE
DIAGNOSIS, 2527
LIVER
CHOLESTASIS, 2525
PYLORUS
STENOSIS, 2126
SECRETION
GASTRIN, 1821
SERUM
AMINO TRANSFERASES, 2037
GASTRIN, 1821
STOMACH
ACID SECRETION, 1821
SECRETION, 1821
SULFOBROMOPHTHALEIN
CLEARANCE STUDY, 2525

INFARCTION
COLON
GANGRENE, 2269
INTESTINES, 2211

INFECTION
EPIDEMIOLOGY
REVIEW, 2622
ETIOLOGY
REVIEW, 2622
GASTROINTESTINAL SYSTEM
PREVENTION, 2604
SURGERY, 2604
HEPATITIS
ANTIBODIES, 1903*
ANTIGENS, 1903*
VIRUSES, 1903*
HEPATITIS, SERUM
ANTIBODIES, 1903*
ANTIGENS, 1903*
VIRUSES, 1903*
LIVER
ECHINOCOCCOSIS, 2352

INFECTION (continued)
PATHOLOGY
REVIEW, 2622
PREVENTION
TRANSMISSION, 2622
TRANSMISSION
REVIEW, 2622

INFECTION, BACTERIA
SEE BACTERIAL INFECTIONS

INFECTION, FUNGUS
SEE MYCOSES

INFLAMMATION
COLON
ENDOSCOPY, 2278

INFLAMMATORY BOWEL DISEASES
COMPLEMENT, 2292*
IMMUNOLOGY, 2292*

INSULIN
IRRADIATION
NAUSEA, 1770*
VOMITING, 1770*
STOMACH
MOTILITY, 1770*

INTERFERON
HEPATITIS, CHRONIC, 2413

INTESTINAL ABSORPTION
AGE FACTORS, 1720*
AMINO ACIDS, 1712*, 1730
DIETARY FACTORS, 1710*
ANEMIA, PERNICIOUS
VITAMIN B12, 2547*
BICARBONATES, 1713*
CELIAC DISEASE
AMINO ACIDS, 2223*
PEPTIDES, 2223*
PROTEIN-LOSING ENTEROPATHIES, 2223*
CHLORIDES, 1713*
CHOLESTEROL
ENZYMES, 1714*
DIETARY FACTORS
MILK, 1718*
DISACCHARIDES, 1711*
DRUG EFFECTS ON
ALCOHOLS, 1723*
FATS
INFANT, 1726*
MORPHOLOGY, 1724*
STOMACH, 1736
FATTY ACIDS, 1737
GLUCOSE
CELIAC DISEASE, 1717*
DISACCHARIDES, 1735
GLYCOPROTEINS, 1727*
HEPATITIS
CHILD, 2387
HEPATITIS, INFECTIOUS
CHILD, 2387
HORMONE EFFECTS ON, 1739
IRON, 1734
MITOCHONDRIA, 1733
TRANSFERRIN, 1729

INTESTINAL ABSORPTION (continued)
LACTOSE
DIETARY FACTORS, 1718*
NEONATE, 1720*
PEPTIDES, 1711*
PHOSPHATES
VITAMIN D, 1721*
PROTEINS
DIETARY FACTORS, 1718*
PURINES, 1709*
RADIONUCLIDES
CIRCULATION, 1705*
DISTENTION, 1705*
PRESSURE STUDY, 1705*
SCHISTOSOMIASIS, 1702
SODIUM
HORMONE EFFECTS ON, 1738
HORMONES, GASTROINTESTINAL, 1738
ULTRASTRUCTURE, 1720*
UREA
UREMIA, 1741
VASOPRESSIN, 1739
VITAMIN B1, 1722*
ALCOHOLISM, 1732
ALCOHOLS, 1723*
DRUG EFFECTS ON, 1723*
VITAMIN B12, 1715*
LIVER CIRRHOSIS, 2466
PREGNANCY, 1742
VITAMIN C, 1740
WATER, 1704*
CHOLESTEROL, 1731
FATTY ACIDS, 1731
HORMONE EFFECTS ON, 1738
HORMONES, GASTROINTESTINAL, 1738

INTESTINAL OBSTRUCTION
ADHESIONS
AGE FACTORS, 2573
ETIOLOGY, 2573
IATROGENESIS, 2573
SURGERY, 2573
ANGIOGRAPHY
MORPHOLOGY, 1998*
ANOMALY, CONGENITAL
PROGNOSIS, 2206*
COLON
ANOMALY, 2282
IATROGENESIS
SURGERY, 2573
KIDNEYS
TRANSPLANTATION, 2541*

INTESTINE, LARGE
SEE ALSO CECUM, COLON
ABSORPTION
FATS, 1724*
ANOMALY, 2236*
BACTERIA
DIETARY FACTORS, 1718*
BLEEDING
DYSPLASIA, 2236*
GASTROINTESTINAL DISEASES
CIRCULATION, 2585
ION TRANSPORT
HORMONE EFFECTS ON, 1708*
HORMONES, GASTROINTESTINAL, 1708*
LACTATES
METABOLISM, 1969

INTESTINE, LARGE (continued)
MORPHOLOGY
DYSENTERY, 2569
MOTILITY
ELECTROPHYSIOLOGY, 1781
THERAPY, 2270
NEOPLASM METASTASIS, 2259
NEOPLASMS, BENIGN
THERAPY, 2263
NEOPLASMS, MALIGNANT, 2258
MORPHOLOGY, 2259
ULTRASTRUCTURE, 2239*
SURGERY
DIET, 2254
TRANSPORT
ELECTROLYTES, 1708*
ULTRASTRUCTURE
DYSENTERY, 2570, 2571

INTESTINE, SMALL
SEE ALSO DUODENUM, ILEUM, JEJUNUM
ABSORPTION, 2583
AMINO ACIDS, 1712*
SCHISTOSOMIASIS, 1702
VITAMIN B12, 1742
ADENOSINE TRIPHOSPHATASE
ALCOHOLS, 1723*
DRUG EFFECTS ON, 1723*
ALKALINE PHOSPHATASE, 1974
CIRCULATION, 2532
BACTERIAL INFECTIONS
BILE ACIDS AND SALTS, 1971
CHILD, 2581
DRUG THERAPY, 2581
PATHOLOGY, 1971
PEPTIDE HYDROLASES, 1971
BLEEDING
DIAGNOSIS, 2049
ENDOSCOPY, 2049
CELLS
MITOSIS, 1981
COLON
POLYPS, 2246
DRUG EFFECTS ON
ANTINEOPLASTIC AGENTS, 1696*
ENDOTOXINS, 1966*
ENZYMES
DIGESTION, 1974
FETUS, 1964*
FOOD, 1973
NEONATE, 1964*
HEMORRHAGE
LIVER CIRRHOSIS, 2455
SURGERY, 2551
IMMUNOGLOBULINS
BINDING, 1719*
CELIAC DISEASE, 2229
ULTRASTRUCTURE, 2229
ION TRANSPORT
CELIAC DISEASE, 1717*
ENTERITIS, 1697*
ISCHEMIA
CONTRACEPTIVES, ORAL, 2204*
LYMPHOCYTES
CELIAC DISEASE, 2600
CHILD, 2600
DIARRHEA, 2600
GASTROENTERITIS, 2600
GIARDIASIS, 2600, 2617*

INTESTINE, SMALL (continued)
LYMPHOCYTES (continued)
MALABSORPTION SYNDROMES, 2617*
LYMPHOMA
REVIEW, 2212
LYSOSOMES
ULTRASTRUCTURE, 2213
MELANOSIS, 2208
MITOSIS
ANTINEOPLASTIC AGENTS, 1696*
DRUG EFFECTS ON, 1696*
GASTRIN, 1803*
HORMONE CONTROL, 1803*
HORMONE EFFECTS ON, 1803*
PARENTERAL ALIMENTATION, 1694*
MORPHOLOGY
ANTINEOPLASTIC AGENTS, 1696*
DRUG EFFECTS ON, 1696*
FOOD, 1973
PARENTERAL ALIMENTATION, 1694*
SCHISTOSOMIASIS, 1702
MORPHOMETRY
PARENTERAL ALIMENTATION, 1694*
MOTILITY
ANESTHETICS, 1786
DRUG EFFECTS ON, 1778, 1786
ELECTROPHYSIOLOGY, 1781
NERVOUS CONTROL, 1753*, 1755*, 1773*
PARASYMPATHOLYTICS, 1778
PROSTAGLANDINS, 1755*
MUSCLES
NERVOUS CONTROL, 1773*
NEOPLASMS, BENIGN, 2246
NEOPLASMS, MALIGNANT
DIAGNOSIS, 1994*
ENDOSCOPY, 1994*
NERVOUS CONTROL
PROSTAGLANDINS, 1755*
NUCLEIC ACIDS
GASTRIN, 1803*
HORMONE EFFECTS ON, 1803*
PARENTERAL ALIMENTATION
GROWTH FACTORS, 1968
PEUTZ-JEGHER'S SYNDROME
MORPHOLOGY, 2245
POLYPS
ENDOSCOPY, 2104
THERAPY, 2104
STOMACH
ACID SECRETION, 2201*
SUCRASE, 1974
TRANSPORT
IMMUNOGLOBULINS, 1719*
IRON, 1733, 1734
VITAMIN B1, 1723*, 1732
ULCER
CHLORIDES, 2601
DRUG-INDUCED, 2601
POTASSIUM, 2601
ULTRASTRUCTURE
ANTINEOPLASTIC AGENTS, 1696*
DRUG EFFECTS ON, 1696*
VITAMIN B1
ALCOHOLISM, 1732

INTESTINES
BACTERIA
CHILD, 2582

INTESTINES (continued)
BACTERIA (continued)
MALABSORPTION SYNDROMES, 2226
BACTERIAL INFECTIONS
BREATH TEST, 1995*
DIAGNOSIS, 2543*
ESCHERICHIA COLI, 2572
CARBOHYDRATES
TRANSPORT, 1716*
CARCINOID TUMOR
COMPLICATIONS, 2202*
ENTERITIS, 2202*
ISCHEMIA, 2202*
SCLEROSIS, 2202*
CHOLERA
ENTEROTOXINS, 1728*
CIRCULATION
DRUG EFFECTS ON, 1983*
ENDOTOXINS, 2579
FOOD POISONING, 2584
H2 RECEPTOR ANTAGONISTS, 1983*
HISTAMINE, 1983*
HORMONE EFFECTS ON, 1738
ELECTROPHYSIOLOGY
HORMONE EFFECTS ON, 1754*
MOTILIN, 1754*
ENZYMES
BLIND LOOP SYNDROME, 1965*
NEONATE, 1976
NUTRITION DISORDERS, 1976
STARVATION, 1976
GASTROENTERITIS
ESCHERICHIA COLI, 2597
GLUCAGON
CELLS, 1851*
HORMONE EFFECTS ON
ESTROGENS, 1978
HORMONES, GASTROINTESTINAL
ISOLATION, 1977
INFARCTION, 2211
ION TRANSPORT
HORMONE EFFECTS ON, 1738
HORMONES, GASTROINTESTINAL, 1738
ISCHEMIA, 2241*
ANGIOGRAPHY, 2214
GANGRENE, 2210
LYMPHOCYTES
ELECTROPHORESIS, 1985*
ELECTROPHYSIOLOGY, 1985*
MOTILITY
HORMONE EFFECTS ON, 1754*
MOTILIN, 1754*
VOMITING, 1752*
NEONATE
NUTRITION DISORDERS, 1976
STARVATION, 1976
NEOPLASMS, MALIGNANT
CHILD, 2250
PARASITES AND PARASITIC DISEASES
DIAGNOSIS, 2543*
PERISTALSIS
SURGERY, 2586
PNEUMATOSIS, 2283
POLYPS, 2285
REVIEW, 2284
SALMONELLOSIS
DIAGNOSIS, 2578
RADIOLOGY, 2578

INTESTINES (continued)
TRANSPORT
HORMONE EFFECTS ON, 1738
PHOSPHATES, 1721*
SODIUM, 1738
WATER, 1738
WATER, ELECTROLYTE BALANCE
CHOLERA, 1728*
ENTEROTOXINS, 1728*

INTUSSUSCEPTION
MENETRIER'S DISEASE
COMPLICATIONS, 2161

ION TRANSPORT
COLON
ACETYLCHOLINE, 1706*
DRUG EFFECTS ON, 1706*
NERVOUS CONTROL, 1706*
DRUG EFFECTS ON
ACETYLCHOLINE, 1706*
DUODENUM
ALCOHOLS, 1707*
BILE, 1707*
CHLORIDES, 1713*
DRUG EFFECTS ON, 1707*
STRESS, 1807*
ENTERITIS
VIRUSES, 1697*
INTESTINE, LARGE
HORMONE EFFECTS ON, 1708*
HORMONES, GASTROINTESTINAL, 1708*
INTESTINE, SMALL
CELIAC DISEASE, 1717*
ENTERITIS, 1697*
INTESTINES
HORMONE EFFECTS ON, 1738
HORMONES, GASTROINTESTINAL, 1738
JEJUNUM
ENTERITIS, 1697*
LIVER
BILE ACIDS AND SALTS, 1933
PANCREAS, 1877
BICARBONATE SECRETION, 1876
CALCIUM, 1857*
HORMONE CONTROL, 1855*
NERVOUS CONTROL, 1855*
SALIVARY GLANDS
HORMONE EFFECTS ON, 1743
HORMONES, GASTROINTESTINAL, 1743
SODIUM, 1743
STOMACH
ASPIRIN, 1793*
CHLORIDES, 1812*
DRUG EFFECTS ON, 1793*
STRESS, 1807*

IRON
ABSORPTION
ANEMIA, 2157
DUODENITIS, 2157
GASTRITIS, 2157
DEFICIENCY, 1734
ANEMIA, 2157, 2602
DUODENUM
TRANSPORT, 1734
INTESTINAL ABSORPTION, 1734
MITOCHONDRIA, 1733
TRANSFERRIN, 1729

IRON (continued)
INTESTINE, SMALL
TRANSPORT, 1733, 1734
TRANSPORT
MITOCHONDRIA, 1733

IRRADIATION
NAUSEA
INSULIN, 1770*
STOMACH
MOTILITY, 1770*
VOMITING
INSULIN, 1770*

ISCHEMIA
COLITIS
DIAGNOSIS, 2275
COLON
CONTRACEPTIVES, ORAL, 2204*
ENTEROCOLITIS
MORPHOLOGY, 2274
GASTROINTESTINAL SYSTEM
HEMORRHAGE, 2210
INTESTINE, SMALL
CONTRACEPTIVES, ORAL, 2204*
INTESTINES, 2241*
ANGIOGRAPHY, 2214
CARCINOID TUMOR, 2202*
GANGRENE, 2210
JAUNDICE, OBSTRUCTIVE
URINARY SYSTEM, 1906*
MESENTERY
ARTERIES, 2214

JAUNDICE
BILIARY TRACT
DRAINAGE, 2540
CONTRACEPTIVES, ORAL
REVIEW, 2332*
DIAGNOSIS
CHOLANGIOGRAPHY, 2475*
INFANT, 2528
SCANNING, SCINTILLATION, 2528
DRUG-INDUCED
HYPERSENSITIVITY, 2367
STEROIDS, 2367
INFANT, 2526
LIPOPROTEINS, 2480
NEOPLASMS, MALIGNANT
COMPLICATIONS, 2473*
DISEASES ASSOCIATED WITH, 2473*
PHOTOTHERAPY
TECHNIQUES, 1905*
PREGNANCY, 2353
WILSON'S DISEASE
DIAGNOSIS, 2357

JAUNDICE, OBSTRUCTIVE
DIAGNOSIS
CHOLANGIOGRAPHY, 2475*
INFANT, 2527
LAPAROSCOPY, 2494
SCANNING, SCINTILLATION, 2022
DRUG THERAPY
VITAMIN K, 2516
ETIOLOGY
BILE, 2519

JAUNDICE, OBSTRUCTIVE (continued)
PROGNOSIS
BILE, 2519
PROTEINS, 2516
URINARY SYSTEM
ISCHEMIA, 1906*

JEJUNUM
SEE ALSO INTESTINE, SMALL
ABSORPTION
AMINO ACIDS, 1712*
HORMONE EFFECTS ON, 1739
ENDOTOXINS, 1966*
FATS
ACID SECRETION, 1837
ION TRANSPORT
ENTERITIS, 1697*
LYMPHOCYTES
CELIAC DISEASE, 2600
CHILD, 2600
DIARRHEA, 2600
GASTROENTERITIS, 2600
GIARDIASIS, 2600, 2617*
MALABSORPTION SYNDROMES, 2617*
MALABSORPTION SYNDROMES
BIOPSY, 2609
TRANSPORT
CELIAC DISEASE, 1717*
GLUCOSE, 1717*, 1735
HORMONE EFFECTS ON, 1739
UREA, 1741
UREMIA, 1741
WATER, 1704*, 1731
ULCER, PEPTIC
GASTRECTOMY, 2144

KIDNEY DISEASES
HORMONES, GASTROINTESTINAL
CHOLECYSTOKININ, 2605
GASTRIN, 2605
GLUCAGON, 2605
LIVER
FIBROSIS, 2350

KIDNEYS
ABSORPTION
VITAMIN C, 1740
HEPATITIS
CHILD, 2374
HEPATITIS, INFECTIOUS
CHILD, 2374
TRANSPLANTATION, 1986*
COMPLICATIONS, 2241*, 2541*
ESOPHAGITIS, 2541*
HEMORRHAGE, 2541*
HEPATITIS, 2541*
INTESTINAL OBSTRUCTION, 2541*
PANCREATITIS, 2541*
PERFORATION, 2541*

LACTASE
BLIND LOOP SYNDROME, 1965*

LACTATES
INTESTINE, LARGE
METABOLISM, 1969

LACTOSE
INTESTINAL ABSORPTION
DIETARY FACTORS, 1718*

LAMBLIASIS
SEE GIARDIASIS

LAPAROSCOPY
JAUNDICE, OBSTRUCTIVE
DIAGNOSIS, 2494
LIVER
NEOPLASMS, 2347
LIVER CIRRHOSIS
DIAGNOSIS, 2436

LARGE INTESTINE
SEE INTESTINE, LARGE

LASER
HEMORRHAGE
THERAPY, 1827
STOMACH
HEMORRHAGE, 1827
ULCER
HEMORRHAGE, 1827

LAXATIVES
SEE CATHARTICS

LIPASE
CHOLECYSTITIS
BILE, 2492
PANCREAS, 1993
SECRETION, 1852*
PANCREAS FUNCTION TESTS, 2020
PANCREATITIS
BILE, 2492
SECRETION
HORMONE EFFECTS ON, 1852*
HORMONES, ADRENAL CORTEX, 1852*

LIPIDS
SEE ALSO FATS, TRIGLYCERIDES
BILE, 2535
BILE ACIDS AND SALTS, 2534
CYSTIC FIBROSIS, 2302*
DRUG EFFECTS ON, 2302*, 2534
ENZYMES, 2302*
ETHNIC FACTORS, 2489
BILIARY TRACT
SECRETION, 1935
CHOLESTEROL
METABOLISM, 1941
CYSTIC FIBROSIS
PLASMA, 2303*
DIGESTION
HORMONE EFFECTS ON, 2549*
FECES
DIETARY FACTORS, 2482
FIBERS, 2482
GALLBLADDER
ETHNIC FACTORS, 2489
HEPATOCYTES
SYNTHESIS, 1943
LIVER
CHEMICAL COMPOSITION, 1944
METABOLISM, 1942, 1945
NEOPLASMS, 1944
PEROXIDATION, 1893*
SYNTHESIS, 1943
METABOLISM
CHOLESTEROL, 1942
DIETARY FACTORS, 1942
DRUG EFFECTS ON, 1896*

LIPIDS (continued)
MICROSOMES
PEROXIDATION, 1893*
PEROXIDATION
DRUG-INDUCED, 1896*
PLASMA
BILE ACIDS AND SALTS, 2534
DRUG EFFECTS ON, 2534
OBESITY, 2222
SHUNT, INTESTINAL, 2222
PORTACAVAL SHUNT
METABOLISM, 1945
SECRETION
BILE, 1881*
DRUG EFFECTS ON, 1881*
SERUM
DIETARY FACTORS, 2482
FIBERS, 2482
SHUNT, INTESTINAL
BILE, 2221
WILSON'S DISEASE
CHOLESTEROL, 2358

LIPOGENESIS
HEPATOCYTES
ULTRASTRUCTURE, 1949

LIPOPROTEINS
BILE ACIDS AND SALTS
METABOLISM, 1948
CHOLESTASIS, 2480
HEPATOCYTES
ULTRASTRUCTURE, 1949
JAUNDICE, 2480
SECRETION
FATTY LIVER, 1947

LIVER
ABSORPTION
RADIATION EFFECTS ON, 2162
ACIDS
MORPHOLOGY, 1914
ADENOSINE TRIPHOSPHATASE
ESTROGENS, 1902*
HORMONE EFFECTS ON, 1902*
ALCOHOLS
PEROXIDATION, 1895*
ALKALINE PHOSPHATASE
CIRCULATION, 2532
AMEBIASIS
REVIEW, 2615*
AMINO ACIDS
METABOLISM, 1904*
AMYLOIDOSIS
DISEASES ASSOCIATED WITH, 2548*
ULTRASTRUCTURE, 2548*
BILE ACIDS AND SALTS
CHOLESTASIS, 2524
CIRCULATION, 1921
METABOLISM, 2535
TOXICITY, 1921
BILIRUBIN
METABOLISM, 1936
BIOPSY
ANTIGENS, 2345
COMPLICATIONS, 2336
HEMATOBILIA, 2336
SARCOIDOSIS, 2329*

LIVER (continued)
CARCINOEMBRYONIC ANTIGEN
LIVER DISEASES, 2423
LIVER DISEASES, ALCOHOLIC, 2423
CELLS
BIOCHEMISTRY, 1879*
ISOLATION, 1879*
MORPHOLOGY, 1879*
CHENODEOXYCHOLIC ACID
SYNTHESIS, 1925
CHOLANGIOGRAPHY
COMPLICATIONS, 2012
NECROSIS, 2012
CHOLESTASIS
INFANT, 2525
CHOLESTEROL
METABOLISM, 1941, 2535
CHOLIC ACID
SYNTHESIS, 1925
CYSTS
DIAGNOSIS, 2338
RUPTURE, 2620
THERAPY, 2338
CYTOCHROMES, 1956
DIAGNOSIS
TECHNIQUES, 2007
DRUG EFFECTS ON
CARCINOGENS, 1898*
VITAMIN A, 1904*
DRUG METABOLISM
ALCOHOLS, 1890*
DIETARY FACTORS, 1891*, 1957
ENZYMES, 1957
FATS, 1957
UREMIA, 1892*
ECHINOCOCCOSIS
CALCIFICATION, 2352
COMPLICATIONS, 2352
CYSTS, 2352
INFECTION, 2352
PERFORATION, 2352
THERAPY, 2352
ELECTROPHYSICLOGY
HEPATITIS, TOXIC, 1918
MITOCHONDRIA, 1918
ENZYMES, 1956
DIETARY FACTORS, 1891*
DRUG EFFECTS ON, 1904*
LIVER DISEASES, ALCOHOLIC, 2421
FATTY ACIDS
DIETARY FACTORS, 1957
FATS, 1957
FETUS, 1920
FIBROSIS
DISEASES ASSOCIATED WITH, 2350
GENETIC FACTORS, 2350
KIDNEY DISEASES, 2350
SHUNT, INTESTINAL, 2219
GLUCONEOGENESIS
DRUG EFFECTS ON, 1904*
GLUCOSE PHOSPHATASE
DIETARY FACTORS, 1952
DRUG EFFECTS ON, 1952
GLUCOSE PHOSPHATE DEHYDROGENASE
DIETARY FACTORS, 1952
DRUG EFFECTS ON, 1952
GLUTAMYLTRANSPEPTIDASE
CHOLESTASIS, 2524

LIVER (continued)
GLUTATHIONE
METABOLISM, 1893*
PEROXIDATION, 1893*
GLYCOGEN
PARENTERAL ALIMENTATION, 1953
WOUNDS AND INJURIES, 1953
GLYCOLYSIS
FETUS, 1954
GRANULOMA
ARTERITIS, 2334*
DISEASES ASSOCIATED WITH, 2334*
HEME
METABOLISM, 1886*
HEPATITIS
MORPHOLOGY, 2365*
HISTOCHEMISTRY
ANTIOXIDANTS, 1955
ION TRANSPORT
BILE ACIDS AND SALTS, 1933
LIPIDS
CHEMICAL COMPOSITION, 1944
METABOLISM, 1942
PEROXIDATION, 1893*
SYNTHESIS, 1943
METABOLISM
LIPIDS, 1945
MICROSOMES
CHEMICAL COMPOSITION, 1944
MITOCHONDRIA
CHEMICAL COMPOSITION, 1944
MORPHOLOGY, 1699
AUSTRALIA ANTIGEN, 2408
DRUG EFFECTS ON, 1898*
HYPERTENSION, PORTAL, 2460
SARCOIDOSIS, 2329*
NECROSIS
METABOLISM, 1893*
PEROXIDATION, 1893*
SHUNT, INTESTINAL, 2219
NEOPLASM METASTASIS
DIAGNOSIS, 2348
SCANNING, SCINTILLATION, 2348
NEOPLASMS
CONTRACEPTIVES, ORAL, 2332*
DIAGNOSIS, 2338, 2347
LAPAROSCOPY, 2347
LIPIDS, 1944
MICROSOMES, 1944
MITOCHONDRIA, 1944
THERAPY, 2338
NEOPLASMS, BENIGN
PATHOLOGY, 2351
NEOPLASMS, MALIGNANT
ALPHA FETOPROTEIN, 1897*
ANGIOGRAPHY, 2007
BIOPSY, 2007
DIAGNOSIS, 2007
DRUG THERAPY, 2333*
LIVER FUNCTION TESTS, 2007
REVIEW, 2333*
SCANNING, SCINTILLATION, 2007, 2339
SURGERY, 2333*
THERAPY, 2333*
ULTRASONOGRAPHY, 2007
OXYGEN
ANESTHESIA, 1910
HYPOXIA, 1889*

LIVER (continued)
OXYGEN (continued)
TRANQUILIZING AGENTS, 1910
PATHOLOGY
ANTIOXIDANTS, 1955
PERFUSION
SOLVENTS, 1959
TEMPERATURE, 1911
REGENERATION
STRESS, 1907*
RUPTURE
DIAGNOSIS, 2360
THERAPY, 2360
SCANNING, SCINTILLATION, 2005
COMPUTERS, 2006
RADIOISOTOPES, 2004
RADIONUCLIDES, 2430*
REVIEW, 2004
TECHNIQUES, 2004, 2430*
STOMACH
RADIOTHERAPY, 2162
SULFOBROMOPHTHALEIN
CLEARANCE STUDY, 2525
SYNTHESIS, 1899*
TEMPERATURE
BIOCHEMISTRY, 1911
THERAPY
AGE FACTORS, 2341
TOXICITY
ACIDS, 1914
CARCINOGENS, 1898*
DRUG METABOLISM, 1913
TRANSPLANTATION, 1986*
TECHNIQUES, 2359, 2587
TRANSPORT
BILE ACIDS AND SALTS, 1882*
BILIRUBIN, 1939
SULFOBROMOPHTHALEIN, 1939
TRIGLYCERIDES
FATTY LIVER, 1951
ULTRASTRUCTURE
CHOLERESIS, 1924
DRUG EFFECTS ON, 1898*
ESTROGENS, 1902*
HORMONE EFFECTS ON, 1902*
UREA
SYNTHESIS, 1888*
VEINS
OBSTRUCTION, 2468*
ULTRASONOGRAPHY, 2468*
VITAMIN E
DEFICIENCY, 1893*
WOUNDS AND INJURIES
BLEEDING, 2361
DIAGNOSIS, 2360
RUPTURE, 2360
SURGERY, 2361
THERAPY, 2360, 2361

LIVER CIRRHOSIS
AMINO ACIDS
DETOXIFICATION, 2452
ANTIBODIES
HUMORAL FACTORS, 1900*
ANTIGENS
HUMORAL FACTORS, 1900*
ASCITES
SURGERY, 2448
THERAPY, 2443, 2445

LIVER CIRRHOSIS (continued)
BLOOD
SULFHYDRYL COMPOUNDS, 2432*
CARBON TETRACHLORIDE
ALPHA FETOPROTEIN, 1897*
COLLAGEN
SYNTHESIS, 1899*
COMPLICATIONS, 2455
RETICULOENDOTHELIAL SYSTEM, 2430*
DIAGNOSIS
ALBUMINS, 2440
ANGIOGRAPHY, 2436
GLOBULINS, 2438
IMMUNOGLOBULINS, 2438
LAPAROSCOPY, 2436
LIVER FUNCTION TESTS, 2436
SCANNING, SCINTILLATION, 2430*, 2436
DISEASES ASSOCIATED WITH
HEMOPHILIA, 2331*
LYMPHOMA, 2372*
NEOPLASMS, MALIGNANT, 2372*
DIURETICS
COMPLICATIONS, 2445
ELECTROLYTES, 2445
DRUG-INDUCED
ALPHA FETOPROTEIN, 1897*
DRUG METABOLISM, 2461
DRUG THERAPY, 2444, 2446, 2461
ENZYMES, 2010
ESOPHAGUS
HEMORRHAGE, 2455
GASTROINTESTINAL SYSTEM
HEMORRHAGE, 2455
HEMORRHAGE
ETIOLOGY, 2455
PROGNOSIS, 2455
SURGERY, 2448
HEPATITIS, CHRONIC
HYPERTENSION, 2412*
PANCREAS, 2462, 2463
HYPERTENSION, PORTAL
PORTACAVAL SHUNT, 2450
SURGERY, 2449
IMMUNOGLOBULINS, 2465
INTESTINAL ABSORPTION
VITAMIN B12, 2466
INTESTINE, SMALL
HEMORRHAGE, 2455
LIVER DISEASES, ALCOHOLIC
DIAGNOSIS, 2426
LIVER FUNCTION TESTS, 2010
MAGNESIUM
DEFICIENCY, 2435*
MITOSIS, 2366
MORPHOLOGY
HYPERTENSION, PORTAL, 2460
NECROSIS, 2366
OXIDOREDUCTASES
ANOMALY, 2434*
CHROMATOGRAPHY, 2434*
ELECTROPHORESIS, 2434*
PANCREAS
SECRETION, 2462, 2463
POTASSIUM
DEFICIENCY, 2435*
SPLEEN, 2467
STOMACH
HEMORRHAGE, 2455

LIVER CIRRHOSIS (continued)
SURGERY
PROGNOSIS, 2453
THERAPY
DIURETICS, 2445
PROGNOSIS, 2453
SURVIVAL, 2453
TRANSFUSION, 2331*
WILSON'S DISEASE
DIAGNOSIS, 2357

LIVER CIRRHOSIS, OBSTRUCTIVE
BILE
BILE ACIDS AND SALTS, 2415
DIAGNOSIS, 2431*, 2437
ANTIBODIES, 2439
DISEASES ASSOCIATED WITH
ARTHRITIS, 2457
EPIDEMIOLOGY, 2431*
IMMUNOLOGY, 2433*, 2464
MORPHOLOGY, 2437

LIVER COMA
AMINO ACIDS, 1960
BLOOD
SULFHYDRYL COMPOUNDS, 2432*
CHILD
THERAPY, 2391
DRUG THERAPY
HORMONES, ADRENAL CORTEX, 2424
STEROIDS, 2424
ETIOLOGY
BILE ACIDS AND SALTS, 2335*
HEPATITIS
CHILD, 2391
THERAPY, 2391
HEPATITIS, INFECTIOUS
CHILD, 2391
THERAPY, 2391
LIVER DISEASES, 2349
NERVOUS CONTROL, 1961
NERVOUS SYSTEM, 1908*
SEDATIVES, 1963
THERAPY
HORMONES, ADRENAL CORTEX, 2424
STEROIDS, 2424
ZINC
DEFICIENCY, 2419

LIVER DISEASES
CLOTTING
LIVER FUNCTION TESTS, 2328*
REVIEW, 2327
DIAGNOSIS
ANTIBODIES, 2344
ANTIGENS, 2344
CHOLANGIOGRAPHY, 2538
ENZYMES, 2344
IMMUNOGLOBULINS, 2344
LIVER FUNCTION TESTS, 2344
PERITONEOSCOPY, 2008
DISEASES ASSOCIATED WITH
ARTERITIS, 2334*
HEMOPHILIA, 2330*, 2331*
DRUG THERAPY, 2342
IMMUNOSUPPRESION, 2340
VITAMIN K, 2516
ENZYMES, 2010, 2030, 2414

LIVER DISEASES (continued)
ERYTHROCYTES
METABOLISM, 2326*
HEPATITIS
MORPHOLOGY, 2365*
HORMONES, 2340
IMMUNOGLOBULINS, 2465
IMMUNOLOGY, 2402
INDOCYANINE GREEN
CLEARANCE STUDY, 2029
LEPTOSPIROSIS
BIOCHEMISTRY, 2590
EPIDEMIOLOGY, 2590
LIVER
CARCINOEMBRYONIC ANTIGEN, 2423
LIVER COMA, 2349
LIVER FUNCTION TESTS, 2010
OBSTRUCTION
DIAGNOSIS, 2538
PROTEINS, 2516
SERUM
BILE ACIDS AND SALTS, 2410
TRANSFUSION, 2330*, 2331*
URINE
OXALATES, 2232

LIVER DISEASES, ALCOHOLIC
DIAGNOSIS, 2429
DRUG THERAPY
HORMONES, ADRENAL CORTEX, 2424
STEROIDS, 2424
GLUCONEOGENESIS
CLEARANCE STUDY, 2420
IMMUNOLOGY, 2402
LIVER
CARCINOEMBRYONIC ANTIGEN, 2423
ENZYMES, 2421
LIVER CIRRHOSIS
DIAGNOSIS, 2426
PLASMA
ACIDS, 2422
AMINO ACIDS, 2422
THERAPY
HORMONES, ADRENAL CORTEX, 2424
STEROIDS, 2424

LIVER FUNCTION TESTS
AUSTRALIA ANTIGEN
CARRIER STATE, 2408
BREATH TEST, 2009
CONTRACEPTIVES, ORAL
REVIEW, 2332*
DRUG EFFECTS ON
ESTROGENS, 2603
ESOPHAGUS
SURGERY, 2074*
HEMOPHILIA, 2330*, 2331*
HEPATITIS, 2010, 2417
COMPLICATIONS, 2395
SULFOBROMOPHTHALEIN, 2395
HEPATITIS, CHRONIC, 2417
HEPATITIS, INFECTIOUS
COMPLICATIONS, 2395
SULFOBROMOPHTHALEIN, 2395
INDOCYANINE GREEN
CLEARANCE STUDY, 2539
METABOLISM, 2539
LIVER
NEOPLASMS, MALIGNANT, 2007

LIVER FUNCTION TESTS (continued)
LIVER CIRRHOSIS, 2010
DIAGNOSIS, 2436
LIVER DISEASES, 2010
CLOTTING, 2328*
DIAGNOSIS, 2344
SARCOIDOSIS, 2329*
SCHISTOSOMIASIS, 2010
SHUNT, INTESTINAL, 2220
TRANSFUSION, 2330*

LIVER INJURY
AMINO ACIDS
METABOLISM, 1950
BILE ACIDS AND SALTS
DRUG EFFECTS ON, 1928
BLEEDING
SURGERY, 2361
THERAPY, 2361
CARBON TETRACHLORIDE
OXYGEN, 1962
COLLAGEN
SYNTHESIS, 1899*
DIET
HYPOXIA, 1950
DRUG EFFECTS ON
ANTIBIOTICS, 1928
DRUG-INDUCED
ANTICOAGULANTS, 2589
ETIOLOGY
ANTICOAGULANTS, 2589
PROTEINS
HYPOXIA, 1950
METABOLISM, 1950
SLEEP
OXYGEN, 1962
STOMACH
RADIOTHERAPY, 2162
SURGERY
TECHNIQUES, 2361

LUNG
SEE RESPIRATORY SYSTEM

LYMPHATIC SYSTEM
APPENDIX
NEOPLASM METASTASIS, 2264
TRANSPORT
FATS, 1725*

LYMPHOCYTES
COLITIS, ULCERATIVE
PROGNOSIS, 2288*
COLON
NEOPLASMS, MALIGNANT, 2238*, 2243
INTESTINE, SMALL
CELIAC DISEASE, 2600
CHILD, 2600
DIARRHEA, 2600
GASTROENTERITIS, 2600
GIARDIASIS, 2600, 2617*
MALABSORPTION SYNDROMES, 2617*
INTESTINES
ELECTROPHORESIS, 1985*
ELECTROPHYSIOLOGY, 1985*
JEJUNUM
CELIAC DISEASE, 2600
DIARRHEA, 2600
GASTROENTERITIS, 2600

LYMPHOCYTES (continued)
JEJUNUM (continued)
GIARDIASIS, 2600, 2617*
MALABSORPTION SYNDROMES, 2617*
RECTUM
NEOPLASMS, MALIGNANT, 2243

LYMPHOMA
AUSTRALIA ANTIGEN
DISEASES ASSOCIATED WITH, 2372*
INTESTINE, SMALL
REVIEW, 2212
LIVER CIRRHOSIS
DISEASES ASSOCIATED WITH, 2372*

LYSOSOMES
INTESTINE, SMALL
ULTRASTRUCTURE, 2213

MAGNESIUM
DEFICIENCY
DIURETICS, 2435*
DRUG-INDUCED, 2435*
LIVER CIRRHOSIS, 2435*

MALABSORPTION SYNDROMES
ANEMIA, PERNICIOUS
VITAMIN B12, 2156
DIAGNOSIS, 2120
OXALATES, 1996*
DISEASES ASSOCIATED WITH
CARDIOVASCULAR SYSTEM, 2583
ENTEROKINASE
DEFICIENCY, 2234
FRUCTOSE
DIAGNOSIS, 2031
IATROGENESIS
GASTRECTOMY, 2120
INTESTINE, SMALL
LYMPHOCYTES, 2617*
INTESTINES
BACTERIA, 2226
JEJUNUM
BIOPSY, 2609
LYMPHOCYTES, 2617*
MILK
IMMUNOLOGY, 2231
PANCREATIC DISEASES
DIAGNOSIS, 2225*
PANCREATITIS, CHRONIC
DISEASES ASSOCIATED WITH, 2322
RADIOTHERAPY
DIAGNOSIS, 2225*
RECTUM
BIOPSY, 2609
SIGMOID
BIOPSY, 2609
SUCROSE, 2234
GROWTH FACTORS, 2233
VITAMIN B12
ETIOLOGY, 2156

MALNUTRITION
SEE NUTRITION DISORDERS

MANOMETRY
ANORECTUM
TECHNIQUES, 2251

MANOMETRY (continued)
COMMON BILE DUCT, 1776
ESOPHAGEAL REFLUX
SURGERY, 2068*
ESOPHAGUS
ATRESIA, 2061*
FISTULA, 2061*
SPASM, 2073*
SPHINCTER, 1744*
TECHNIQUES, 1744*, 1745*
HIATAL HERNIA
SURGERY, 2068*, 2098
ODDI'S SPHINCTER, 1776
PANCREATIC DUCT, 1776

MEGACOLON
SEE ALSO HIRSCHSPRUNG'S DISEASE
CECUM
VALVE, 2273
FAMILIAL FACTORS, 2279
HIRSCHSPRUNG'S DISEASE, 2280
ILEUM
VALVE, 2273

MEGAESOPHAGUS
SEE ACHALASIA

MENETRIER'S DISEASE
CHILD
DIAGNOSIS, 2160
ETIOLOGY, 2160
COMPLICATIONS
INTUSSUSCEPTION, 2161
DIAGNOSIS
MORPHOLOGY, 2123
RADIOLOGY, 2123
RECTUM
NEOPLASMS, MALIGNANT, 2121
POLYPS, 2121

MERCAPTANS
SEE SULFHYDRYL COMPOUNDS

MESENTERY
ARTERIES
ISCHEMIA, 2214
CIRCULATION
DRUG EFFECTS ON, 1983*
H2 RECEPTOR ANTAGONISTS, 1983*
HISTAMINE, 1983*

METASTASIS
SEE NEOPLASM METASTASIS

MICELLES
BILE ACIDS AND SALTS
HORMONE EFFECTS ON, 2549*

MICROSOMES
LIPIDS
PEROXIDATION, 1893*
LIVER
CHEMICAL COMPOSITION, 1944
NEOPLASMS, 1944
PHENOBARBITAL
OXYGEN, 1962

MILK
IMMUNOGLOBULINS
ESCHERICHIA COLI, 2613, 2614
INTESTINAL ABSORPTION
DIETARY FACTORS, 1718*
MALABSORPTION SYNDROMES
IMMUNOLOGY, 2231

MITOCHONDRIA
INTESTINAL ABSORPTION
IRON, 1733
LIVER
CHEMICAL COMPOSITION, 1944
ELECTROPHYSIOLOGY, 1918
NEOPLASMS, 1944
STOMACH
ASPIRIN, 1794*
DRUG EFFECTS ON, 1794*
SALICYLATES, 1794*
TRANSPORT
IRON, 1733

MITOSIS
ANTRUM
GASTRIN, 1803*
HORMONE CONTROL, 1803*
HORMONE EFFECTS ON, 1803*
ENTERECTOMY, 1695*
ESOPHAGUS
BARRETT'S SYNDROME, 2088
ESOPHAGEAL REFLUX, 2066*
ESOPHAGITIS, 2066*
GASTROINTESTINAL SYSTEM
GASTRIN, 1803*
HORMONE CONTROL, 1803*
HORMONE EFFECTS ON, 1803*
INTESTINE, SMALL
ANTINEOPLASTIC AGENTS, 1696*
CELLS, 1981
DRUG EFFECTS ON, 1696*
GASTRIN, 1803*
HORMONE CONTROL, 1803*
HORMONE EFFECTS ON, 1803*
PARENTERAL ALIMENTATION, 1694*
LIVER CIRRHOSIS, 2366
STOMACH
CELLS, 1817
GASTRIN, 1824
HYPERCHLORHYDRIA, 1824

MOTILIN
INTESTINES
ELECTROPHYSIOLOGY, 1754*
MOTILITY, 1754*
REVIEW, 1979
STOMACH
HORMONE CONTROL, 1765*, 1766*
HORMONE EFFECTS ON, 1765*
MOTILITY, 1765*, 1766*

MOTILITY
ANTRUM
NERVOUS CONTROL, 1783
ANUS
GLUCAGON, 1759*
HORMONE EFFECTS ON, 1759*
SECRETIN, 1759*

MOTILITY (continued)
CECUM
ELECTROPHYSIOLOGY, 1781
COLON
CATHARTICS, 1758*
CHOLECYSTOKININ, 1757*
DRUG EFFECTS ON, 1757*, 1758*
GLUCAGON, 1759*
HORMONE EFFECTS ON, 1757*, 1759*
PENTAGASTRIN, 1757*
PERFUSION, 1756*
SECRETIN, 1759*
COMMON BILE DUCT, 1776
NERVOUS CONTROL, 1773*
DUODENUM
NERVOUS CONTROL, 1773*
ESOPHAGEAL DISEASES
DIAGNOSIS, 2054
RADIOLOGY, 2054
ESOPHAGUS
ACHALASIA, 2083
AGE FACTORS, 1750*, 2075
DEGLUTITION, 1746*
HORMONE EFFECTS ON, 1747*, 1774
HORMONES, GASTROINTESTINAL, 1774
MUSCLES, 1749*
NERVOUS CONTROL, 1745*
PREGNANCY, 1747*
PRESSURE STUDY, 1748*
RADIOISOTOPES, 2083
SECRETIN, 1774
SMOKING, 1751*
SPHINCTER, 1744*, 1746*, 1748*, 1750*, 1774
TECHNIQUES, 2083
GALLBLADDER
ANALGESICS AND ANTIPYRETICS, 1785
ANTI-INFLAMMATORY AGENTS, 1785
DRUG EFFECTS ON, 1771*, 1785
HORMONE EFFECTS ON, 1772*
HORMONES, GASTROINTESTINAL, 1772*
ILEUM
ELECTROPHYSIOLOGY, 1781
NERVOUS CONTROL, 1755*
PROSTAGLANDINS, 1755*
INTESTINE, LARGE
ELECTROPHYSIOLOGY, 1781
THERAPY, 2270
INTESTINE, SMALL
ANESTHETICS, 1786
DRUG EFFECTS ON, 1778, 1786
ELECTROPHYSIOLOGY, 1781
NERVOUS CONTROL, 1753*, 1755*, 1773*
PARASYMPATHOLYTICS, 1778
PROSTAGLANDINS, 1755*
INTESTINES
HORMONE EFFECTS ON, 1754*
MOTILIN, 1754*
VOMITING, 1752*
IRRADIATION
STOMACH, 1770*
ODDI'S SPHINCTER, 1776
PANCREATIC DUCT, 1776
RECTUM
GLUCAGON, 1759*
HORMONE EFFECTS ON, 1759*
SECRETIN, 1759*

MOTILITY (continued)
STOMACH
DIABETES, 2111*
DRUG EFFECTS ON, 1769*, 1784
ELECTROPHYSIOLOGY, 1763*
FOOD, 1761*, 1762*
GLUCOSE, 1777
HIATAL HERNIA, 2069*
HORMONE CONTROL, 1764*, 1765*, 1766*
HORMONE EFFECTS ON, 1764*, 1765*
HORMONES, GASTROINTESTINAL, 1764*
INSULIN, 1770*
MOTILIN, 1765*, 1766*
NERVOUS CONTROL, 1783
PYLOROPLASTY, 1768*
RADIOLOGY, 2056
REFLUX, 2069*
SURGERY, 2183
TECHNIQUES, 1760*, 1779, 2042
ULCER, PEPTIC, 1769*, 2164*
VAGOTOMY, 1768*
STOMACH DISEASES
DIAGNOSIS, 2056
RADIOLOGY, 2056
SURGERY
DRUG EFFECTS ON, 2586

MUCUS
CYSTIC FIBROSIS
BILE ACIDS AND SALTS, 1919
SECRETION
ULCER, PEPTIC, 1818
STOMACH
ENDOSCOPY, 1703
SECRETION, 1818, 1820

MUSCLE RELAXANTS
DUODENUM
RADIOLOGY, 2142
STOMACH
RADIOLOGY, 2142

MUSCLES
COMMON BILE DUCT
NERVOUS CONTROL, 1773*
DUODENUM
NERVOUS CONTROL, 1773*
ESOPHAGUS
MORPHOLOGY, 2075
MOTILITY, 1749*
INTESTINE, SMALL
NERVOUS CONTROL, 1773*

MYCOSES
ESOPHAGUS
IMMUNITY, 2089

NARCOTICS
PANCREAS
BICARBONATE SECRETION, 1867

NAUSEA
IRRADIATION
INSULIN, 1770*

NECROSIS
CHOLANGIOGRAPHY
LIVER, 2012

NECROSIS (continued)
ENTERITIS
BACTERIAL INFECTIONS, 2560
COMPLICATIONS, 2560
SEPSIS, 2560
HEPATITIS
AUSTRALIA ANTIGEN, 2390
HEPATITIS, INFECTIOUS
AUSTRALIA ANTIGEN, 2390
LIVER
METABOLISM, 1893*
PEROXIDATION, 1893*
SHUNT, INTESTINAL, 2219
LIVER CIRRHOSIS, 2366

NEONATE
BILE ACIDS AND SALTS
DIETARY FACTORS, 1970
BILE DUCTS
ATRESIA, 2476*
BILIARY TRACT
HYPOPLASIA, 2476*
COLON
ABSORPTION, 1720*
ULTRASTRUCTURE, 1720*
COMMON BILE DUCT
PERFORATION, 2476*
DUODENUM
BILE ACIDS AND SALTS, 1970
HEPATITIS
SEASONAL FACTORS, 2481
INTESTINAL ABSORPTION, 1720*
INTESTINE, SMALL
ENZYMES, 1964*
INTESTINES
ENZYMES, 1976
NUTRITION DISORDERS, 1976
STARVATION, 1976
SERUM
AMINO TRANSFERASES, 2037

NEOPLASM METASTASIS
APPENDIX
LYMPHATIC SYSTEM, 2264
COLON, 2260
ESOPHAGUS
ENDOSCOPY, 2093
PATHOLOGY, 2093
INTESTINE, LARGE, 2259
LIVER
DIAGNOSIS, 2348
SCANNING, SCINTILLATION, 2348
RECTUM, 2260

NEOPLASMS
COLON, 2244
DIAGNOSIS, 2237*
DIAGNOSIS
BLOOD, 2237*
FECES, 2237*
FECES
BLOOD, 2237*
HORMONES, GASTROINTESTINAL, 2564
LIVER
CONTRACEPTIVES, ORAL, 2332*
DIAGNOSIS, 2338, 2347
LAPAROSCOPY, 2347
LIPIDS, 1944
MICROSOMES, 1944

NEOPLASMS (continued)
LIVER (continued)
MITOCHONDRIA, 1944
THERAPY, 2338
PANCREAS
BIOPSY, 2002*, 2297*
DIAGNOSIS, 2002*, 2019, 2297*, 2308
SCANNING, SCINTILLATION, 2308
ULTRASONOGRAPHY, 2019
RECTUM
DIAGNOSIS, 2237*
THERAPY, 2262
SALIVARY GLANDS
CHILD, 2594
STOMACH
BIOPSY, 2057
DIAGNOSIS, 2057

NEOPLASMS, BENIGN
COLON
POLYPS, 2246
DUODENUM, 2207
ESOPHAGUS
DIAGNOSIS, 2094, 2095
PROGNOSIS, 2094
RADIOLOGY, 2094, 2095
INTESTINE, LARGE
THERAPY, 2263
INTESTINE, SMALL, 2246
LIVER
PATHOLOGY, 2351
PANCREAS
ANEMIA, 2309
BIOPSY, 2297*
DIAGNOSIS, 2309
DISEASES ASSOCIATED WITH, 2309
PANCREATIC DISEASES, 2297*

NEOPLASMS, MALIGNANT
AUSTRALIA ANTIGEN
DISEASES ASSOCIATED WITH, 2372*
BILE DUCTS
SURGERY, 2486
THERAPY, 2486
COLITIS, ULCERATIVE
BIOPSY, 2290*, 2291*
DIAGNOSIS, 2290*, 2291*
DISEASES ASSOCIATED WITH, 2290*, 2291*
REVIEW, 2291*
RISK FACTORS, 2290*, 2291*, 2294
COLON
AGE FACTORS, 2238*
BIOPSY, 2290*, 2291*
CARCINOEMBRYONIC ANTIGEN, 2021, 2243
COMPLICATIONS, 2269
DIAGNOSIS, 2021, 2290*, 2291*
GANGRENE, 2269
IMMUNOLOGY, 2243
LYMPHOCYTES, 2238*, 2243
PROGNOSIS, 2021
RECURRENCE, 2021
REVIEW, 2291*
RISK FACTORS, 2290*, 2294
COMPLICATIONS
CHOLESTASIS, 2473*
JAUNDICE, 2473*

NEOPLASMS, MALIGNANT (continued)
DEGLUTITION DISORDERS
DILATATION, 2092
THERAPY, 2092
DIAGNOSIS
TECHNIQUES, 2052
DISEASES ASSOCIATED WITH
CHOLESTASIS, 2473*
JAUNDICE, 2473*
DUODENUM
DISEASES ASSOCIATED WITH, 2490
ESOPHAGUS
DEGLUTITION DISORDERS, 2063*, 2092
DIAGNOSIS, 2091
ENDOSCOPY, 2093
EPIDEMIOLOGY, 2090, 2091
PATHOLOGY, 2093
STENOSIS, 2110
SURGERY, 2063*
THERAPY, 2063*
GASTRECTOMY
COMPLICATIONS, 2149
DIAGNOSIS, 2043
ENDOSCOPY, 2043
GASTROINTESTINAL SYSTEM
BIOPSY, 2050
CYTOLOGY, 2050
DIAGNOSIS, 2050, 2052
ENDOSCOPY, 2050
RADIOLOGY, 2052
HORMONES, GASTROINTESTINAL
DIARRHEA, 2563
INTESTINE, LARGE, 2258
MORPHOLOGY, 2259
ULTRASTRUCTURE, 2239*
INTESTINE, SMALL
DIAGNOSIS, 1994*
ENDOSCOPY, 1994*
INTESTINES
CHILD, 2250
LIVER
ALPHA FETOPROTEIN, 1897*
ANGIOGRAPHY, 2007
BIOPSY, 2007
DIAGNOSIS, 2007
DRUG THERAPY, 2333*
LIVER FUNCTION TESTS, 2007
REVIEW, 2333*
SCANNING, SCINTILLATION, 2007, 2339
SURGERY, 2333*
THERAPY, 2333*
ULTRASONOGRAPHY, 2007
LIVER CIRRHOSIS
DISEASES ASSOCIATED WITH, 2372*
PANCREAS
ALPHA FETOPROTEIN, 2299*
ANTIGENS, 2299*
BIOPSY, 2297*
CARCINOEMBRYONIC ANTIGEN, 2021, 2299*
DIAGNOSIS, 2016, 2021, 2297*, 2298*, 2299*, 2300*, 2496
GLUCAGON, 2300*
GROWTH FACTORS, 1865*
PANCREATECTOMY, 2306*
PROGNOSIS, 2021
RECURRENCE, 2021
SCANNING, SCINTILLATION, 2298*

NEOPLASMS, MALIGNANT (continued)
PANCREATECTOMY
PROGNOSIS, 2306*
SURVIVAL, 2306*
TECHNIQUES, 2306*
RECTUM
CARCINOEMBRYONIC ANTIGEN, 2243, 2249
DISEASES ASSOCIATED WITH, 2121
IMMUNOLOGY, 2243
LYMPHOCYTES, 2243
MENETRIER'S DISEASE, 2121
RADIOTHERAPY, 2249
THERAPY, 2261
SALIVARY GLANDS
MORPHOLOGY, 2595
ULTRASTRUCTURE, 2595
STOMACH, 2122
AGE FACTORS, 2151
DIAGNOSIS, 2040
ENDOSCOPY, 2040
GASTRECTOMY, 2149
GASTRIN, 2112*
GUANOSINE CYCLIC 3',5' MONOPHOSPHATE, 2163*
HYPERCALCEMIA, 1797*
PROGNOSIS, 2152
RADIOTHERAPY, 2162
SURVIVAL, 2152
THERAPY
REVIEW, 2333*
VATER'S AMPULLA
DISEASES ASSOCIATED WITH, 2490
ENDOSCOPY, 2523
SURGERY, 2523

NERVOUS CONTROL
ANTRUM
MOTILITY, 1783
COLON
ION TRANSPORT, 1706*
COLONIC DISEASES, 2235*
COMMON BILE DUCT
MOTILITY, 1773*
MUSCLES, 1773*
DUODENUM
MOTILITY, 1773*
MUSCLES, 1773*
ESOPHAGUS
MOTILITY, 1749*
ILEUM
MOTILITY, 1755*
PROSTAGLANDINS, 1755*
INTESTINE, SMALL
MOTILITY, 1753*, 1755*, 1773*
MUSCLES, 1773*
PROSTAGLANDINS, 1755*
LIVER COMA, 1961
PANCREAS
ION TRANSPORT, 1855*
SECRETION, 1855*
SECRETION
GASTRIN, 1829, 1840
STOMACH
ACID SECRETION, 2172*
MOTILITY, 1783
VAGOTOMY, 1767*

NERVOUS SYSTEM
LIVER COMA, 1908*

NEUROMUSCULAR DISEASES
EPINEPHRINE
METABOLISM, 2124
NOREPINEPHRINE
METABOLISM, 2124
STOMACH
EPINEPHRINE, 2124
NOREPINEPHRINE, 2124

NITROGEN
METABOLISM
GASTRECTOMY, 2119

NOREPINEPHRINE
METABOLISM
NEUROMUSCULAR DISEASES, 2124
STOMACH
NEUROMUSCULAR DISEASES, 2124

NUCLEIC ACIDS
ANTRUM
GASTRIN, 1803*
INTESTINE, SMALL
GASTRIN, 1803*
HORMONE EFFECTS ON, 1803*
PANCREAS
SYNTHESIS, 1862*
STOMACH
GASTRIN, 1803*
HORMONE EFFECTS ON, 1803*
SYNTHESIS, 1824
SYNTHESIS
FEEDING, 1862*

NUTRITION
SHUNT, INTESTINAL, 2219

NUTRITION DISORDERS
GASTRECTOMY
COMPLICATIONS, 2153
INTESTINES
ENZYMES, 1976
NEONATE, 1976
PARASITES AND PARASITIC DISEASES
DISEASES ASSOCIATED WITH, 1988
STOMACH
SURGERY, 2153

OBESITY
GLUCOSE
METABOLISM, 2216
PLASMA
LIPIDS, 2222
SURGERY
GASTRIC BYPASS, 2205*
SHUNT, INTESTINAL, 2205*
THERAPY
GASTRIC BYPASS, 2205*
SHUNT, INTESTINAL, 2205*

OBSTRUCTION
BILE DUCTS
CHOLANGIOGRAPHY, 2495
DIAGNOSIS, 2495
RADIOLOGY, 2495
BILIARY TRACT DISEASES
DIAGNOSIS, 2538
DUODENUM
ANOMALY, CONGENITAL, 2206*
PROGNOSIS, 2206*

OBSTRUCTION (continued)
LIVER
VEINS, 2468*
LIVER DISEASES
DIAGNOSIS, 2538
STOMACH, 2133
VEINS
DIAGNOSIS, 2468*

OBSTRUCTIVE JAUNDICE
SEE JAUNDICE, OBSTRUCTIVE

ODDI'S SPHINCTER
MANOMETRY, 1776
MOTILITY, 1776
PRESSURE STUDY, 1776

ORAL CONTRACEPTIVES
SEE CONTRACEPTIVES, ORAL

OSMOTIC PRESSURE
DIARRHEA
ETIOLOGY, 2554

OXALATES
MALABSORPTION SYNDROMES
DIAGNOSIS, 1996*
URINE
GASTROINTESTINAL DISEASES, 2232
LIVER DISEASES, 2232
PANCREATIC DISEASES, 2232
SHORT BOWEL SYNDROME, 2232

OXIDATION
BILIRUBIN
METABOLISM, 1937

OXIDOREDUCTASES
ANOMALY
LIVER CIRRHOSIS, 2434*
BINDING
IMMUNOGLOBULINS, 2434*
CHROMATOGRAPHY
LIVER CIRRHOSIS, 2434*
ELECTROPHORESIS
LIVER CIRRHOSIS, 2434*

OXYGEN
HEPATITIS, TOXIC
CARBON TETRACHLORIDE, 1962
LIVER
ANESTHESIA, 1910
HYPOXIA, 1889*
TRANQUILIZING AGENTS, 1910
LIVER INJURY
CARBON TETRACHLORIDE, 1962
SLEEP, 1962
MICROSOMES
PHENOBARBITAL, 1962

PAIN
PANCREATITIS, CHRONIC
DRAINAGE, 2313
SURGERY, 2313

PANCREAS
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE
HORMONE EFFECTS ON, 1874
SOMATOSTATIN, 1874

PANCREAS (continued)
ADENYL CYCLASE
HORMONE EFFECTS ON, 1857*
AMYLASES
HORMONE EFFECTS ON, 1858*
ANOMALY
DISEASES ASSOCIATED WITH, 2304*
SURGERY, 2304*
BICARBONATE SECRETION
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 1872
DRUG EFFECTS ON, 1860*, 1867
ENKEPHALINS, 1867
FATTY ACIDS, 1861*
GUANOSINE CYCLIC 3',5' MONOPHOSPHATE, 1872
HORMONE CONTROL, 1871, 1873
HORMONE EFFECTS ON, 1858*, 1873, 1875
ION TRANSPORT, 1876
NARCOTICS, 1867
PROSTAGLANDINS, 1875
SECRETIN, 1871
SOMATOSTATIN, 1873
BIOPSY
TECHNIQUES, 2297*
CIRCULATION
HORMONE EFFECTS ON, 1875
PROSTAGLANDINS, 1875
COPPER
WILSON'S DISEASE, 2356
DRUG EFFECTS ON
ALCOHOLS, 2310
ELECTROPHYSIOLOGY
CERULEIN, 1854*
DRUG EFFECTS ON, 1854*
POTASSIUM, 1854*
FISTULA
ASCITES, 2441
CHILD, 2441
HEMORRHAGE, 2441
GASTROINTESTINAL DISEASES
SECRETION, 2591
GLUCAGON
CELLS, 1851*
GUANOSINE CYCLIC 3',5' MONOPHOSPHATE, 1857*
HORMONE EFFECTS ON, 1858*
HEPATITIS, CHRONIC
SECRETION, 2462, 2463
HORMONE EFFECTS ON
CHOLECYSTOKININ, 1858*
HORMONES, 1868, 1870
ION TRANSPORT, 1877
CALCIUM, 1857*
HORMONE CONTROL, 1855*
NERVOUS CONTROL, 1855*
LIPASE, 1993
LIVER CIRRHOSIS
HEPATITIS, CHRONIC, 2462, 2463
SECRETION, 2462, 2463
MORPHOLOGY
BIOPSY, 2023
CHOLECYSTITIS, 2023
DRUG EFFECTS ON, 2310
ULCER, PEPTIC, 2023
NEOPLASMS
BIOPSY, 2002*, 2297*

PANCREAS (continued)
NEOPLASMS (continued)
DIAGNOSIS, 2002*, 2019, 2297*, 2308
SCANNING, SCINTILLATION, 2308
ULTRASONOGRAPHY, 2019
NEOPLASMS, BENIGN
ANEMIA, 2309
BIOPSY, 2297*
DIAGNOSIS, 2309
DISEASES ASSOCIATED WITH, 2309
PANCREATIC DISEASES, 2297*
NEOPLASMS, MALIGNANT
ALPHA FETOPROTEIN, 2299*
ANTIGENS, 2299*
BIOPSY, 2297*
CARCINOEMBRYONIC ANTIGEN, 2021, 2299*
DIAGNOSIS, 2016, 2021, 2297*, 2298*, 2299*, 2300*, 2496
GLUCAGON, 2300*
GROWTH FACTORS, 1865*
PANCREATECTOMY, 2306*
PROGNOSIS, 2021
RECURRENCE, 2021
SCANNING, SCINTILLATION, 2298*
NUCLEIC ACIDS
SYNTHESIS, 1862*
PRESSURE STUDY
FEEDING, 1864*
PROTEINS
SYNTHESIS, 1863*
SCANNING, SCINTILLATION
AMINO ACIDS, 1850*
RADIONUCLIDES, 1850*
SECRETION, 1849*, 1877
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 1872
AMYLASES, 1853*, 1854*, 1874
CALCIUM, 1857*
DIETARY FACTORS, 1839
DRUG EFFECTS ON, 1854*, 1860*, 1866, 1867, 2310
ENZYMES, 1866, 1874
FATS, 1839
FEEDING, 1864*
GUANOSINE CYCLIC 3',5' MONOPHOSPHATE, 1872
HORMONE CONTROL, 1839, 1855*, 1869, 1873, 1874
HORMONE EFFECTS ON, 1791, 1858*, 1868, 1869, 1870, 1873, 1874, 1875, 1878
LIPASE, 1852*
NERVOUS CONTROL, 1855*
PROTEINS, 1852*, 1867, 1878
SMOKING, 1859*
WILSON'S DISEASE, 2356
STOMACH
ACID SECRETION, 1837
TRANSPLANTATION, 1986*

PANCREAS FUNCTION TESTS
CHOLECYSTOKININ, 2020
FECES
CHYMOTRYPSIN, 2307
LIPASE, 2020
PANCREATITIS, CHRONIC
DIAGNOSIS, 2321

PANCREAS FUNCTION TESTS (continued)
PANCREOZYMIN, 2020, 2307
SECRETIN, 2020, 2307

PANCREATECTOMY
NEOPLASMS, MALIGNANT
PROGNOSIS, 2306*
SURVIVAL, 2306*
TECHNIQUES, 2306*
PANCREAS
NEOPLASMS, MALIGNANT, 2306*

PANCREATIC DISEASES
AMYLASES
CLEARANCE STUDY, 2311*
DIAGNOSIS
BIOPSY, 2023, 2297*
ENDOSCOPY, 2015
PANCREATOGRAPHY, 2015
TOMOGRAPHY, 2017, 2035
ULTRASONOGRAPHY, 2015, 2039
DRUG THERAPY
ANTACIDS, 2305*
ENZYMES, 2305*
H2 RECEPTOR ANTAGONISTS, 2305*
ENDOSCOPY
PANCREATOGRAPHY, 2015
MALABSORPTION SYNDROMES
DIAGNOSIS, 2225*
PANCREAS
NEOPLASMS, BENIGN, 2297*
TOMOGRAPHY
DIAGNOSIS, 2001*
ULTRASONOGRAPHY
DIAGNOSIS, 2001*
URINE
OXALATES, 2232

PANCREATIC DUCT
BICARBONATE SECRETION
HORMONE CONTROL, 1856*
HORMONE EFFECTS ON, 1856*
BILE DUCTS
ENDOSCOPY, 2003*
CALCULI
ENDOSCOPY, 2523
SURGERY, 2523
CELLS
SECRETION, 1856*
ENDOSCOPY
BIOPSY, 2003*
MANOMETRY, 1776
MOTILITY, 1776
PRESSURE STUDY, 1776
REFLUX, 1775
SECRETION
HORMONE CONTROL, 1856*
HORMONE EFFECTS ON, 1856*

PANCREATITIS
AMYLASES
CLEARANCE STUDY, 2311*, 2312
BILE
AMYLASES, 2492
LIPASE, 2492
COMPLICATIONS
HYPERLIPEMIA, 2314
DISEASES ASSOCIATED WITH
ANOMALY, 2304*

PANCREATITIS (continued)
EPIDEMIOLOGY, 2323
ETIOLOGY
ALCOHOLISM, 2317
DIURETICS, 2317
KIDNEYS
TRANSPLANTATION, 2541*
PERITONITIS
COMPLICATIONS, 2592
PROGNOSIS, 2323
COMPLEMENT, 2316
SERUM
COMPLEMENT, 2316
SURVIVAL, 2323

PANCREATITIS, CHRONIC
ALCOHOLISM, 2324
ETIOLOGY, 2325
PROGNOSIS, 2325
COMPLICATIONS
DIAGNOSIS, 2018
HYPERLIPEMIA, 2314
ULTRASONOGRAPHY, 2018
DIAGNOSIS
PANCREAS FUNCTION TESTS, 2321
SALIVA, 2318, 2319
ULTRASONOGRAPHY, 2018
DISEASES ASSOCIATED WITH
MALABSORPTION SYNDROMES, 2322
STEATORRHEA, 2322
DRAINAGE
PAIN, 2313
ETIOLOGY, 2324
ALCOHOLISM, 2315
HORMONES, 2320
HORMONES, GASTROINTESTINAL, 2320
SALIVARY GLANDS
SECRETION, 2318, 2319
SURGERY
PAIN, 2313

PANCREATOGRAPHY
ENDOSCOPY
TECHNIQUES, 2015
PANCREATIC DISEASES
DIAGNOSIS, 2015
ENDOSCOPY, 2015

PANCREOZYMIN
PANCREAS FUNCTION TESTS, 2020, 2307

PARASITES AND PARASITIC DISEASES
DISEASES ASSOCIATED WITH
NUTRITION DISORDERS, 1988
INTESTINES
DIAGNOSIS, 2543*

PARASYMPATHOLYTICS
BILE ACIDS AND SALTS
METABOLISM, 1778
FOOD, 1789
INTESTINE, SMALL
MOTILITY, 1778
SALIVARY GLANDS
DRUG EFFECTS ON, 1789
SECRETION
SALIVA, 1789
STOMACH
DRUG EFFECTS ON, 2148
SECRETION, 2148

PARASYMPATHOMIMETICS
SERUM
GASTRIN, 1822

PARATYPHOID FEVERS
SEE SALMONELLOSIS

PARENTERAL ALIMENTATION
COLITIS, ULCERATIVE
CHILD, 2628
CROHN'S DISEASE
CHILD, 2628
FATTY LIVER
GLUCOSE, 1951
ILEUM
AMINO ACIDS, 1968
INTESTINE, SMALL
GROWTH FACTORS, 1968
MITOSIS, 1694*
MORPHOLOGY, 1694*
MORPHOMETRY, 1694*
LIVER
GLYCOGEN, 1953
STOMACH
AMINO ACIDS, 1968

PENTAGASTRIN
ACID SECRETION
SOMATOSTATIN, 1810*
COLON
ELECTROPHYSIOLOGY, 1757*
MOTILITY, 1757*
PROTEINS
SYNTHESIS, 1808*

PEPSIN
SECRETION
DRUG EFFECTS ON, 1809*, 1813*
H2 RECEPTOR ANTAGONISTS, 1813*
HISTAMINE, 1813*
STOMACH
ANTACIDS, 1835
DRUG EFFECTS ON, 1848
SECRETION, 1813*, 1835, 1848
ULCER, PEPTIC
DISTENTION, 2166*

PEPTIC ULCER
SEE ULCER, PEPTIC

PEPTIDASE
ENTERITIS, 2561

PEPTIDE HYDROLASES
INTESTINE, SMALL
BACTERIAL INFECTIONS, 1971

PEPTIDES
CELIAC DISEASE
INTESTINAL ABSORPTION, 2223*
INTESTINAL ABSORPTION, 1711*

PERFORATION
COMMON BILE DUCT
NEONATE, 2476*
SURGERY, 2476*
DUODENUM
ULCER, PEPTIC, 2179, 2192

PERFORATION (continued)
KIDNEYS
TRANSPLANTATION, 2541*
LIVER
ECHINOCOCCOSIS, 2352
PYLORUS
ULCER, PEPTIC, 2131
STOMACH
ULCER, PEPTIC, 2131, 2175
ULCER
STRESS, 2132
ULCER, PEPTIC
COMPLICATIONS, 2131
H2 RECEPTOR ANTAGONISTS, 2192
SURGERY, 2179
THERAPY, 2175, 2179

PERFUSION
COLON
ELECTROPHYSIOLOGY, 1756*
MOTILITY, 1756*
PRESSURE STUDY, 1756*
LIVER
SOLVENTS, 1959
TEMPERATURE, 1911

PERISTALSIS
ESOPHAGUS, 1746*
INTESTINES
SURGERY, 2586

PERITONEOSCOPY
LIVER DISEASES
DIAGNOSIS, 2008

PERITONITIS
ANGIOGRAPHY
MORPHOLOGY, 1998*
COMPLICATIONS
PANCREATITIS, 2592

PEROXIDATION
LIPIDS
DRUG-INDUCED, 1896*
LIVER
ALCOHOLS, 1895*
GLUTATHIONE, 1893*
LIPIDS, 1893*
NECROSIS, 1893*
MICROSOMES
LIPIDS, 1893*

PEUTZ-JEGHER'S SYNDROME
COLON
MORPHOLOGY, 2245
INTESTINE, SMALL
MORPHOLOGY, 2245

PHENOBARBITAL
MICROSOMES
OXYGEN, 1962

PHOSPHATASE, ALKALINE
SEE ALKALINE PHOSPHATASE

PHOSPHATES
INTESTINAL ABSORPTION
VITAMIN D, 1721*
INTESTINES
TRANSPORT, 1721*

PHOSPHOLIPIDS
CYSTIC FIBROSIS
ABSORPTION, 2303*

PHOSPHORYLATION, OXIDATIVE
SEE OXIDATIVE PHOSPHORYLATION

PHOTOTHERAPY
BILIRUBIN
BILE, 1938
COMPLICATIONS, 2364
GENETIC FACTORS, 2364
HYPERBILIRUBINEMIA
TECHNIQUES, 1905*
JAUNDICE
TECHNIQUES, 1905*

PLASMA
ALCOHOLISM
DIAGNOSIS, 2422
COENZYMES
ALCOHOLISM, 1991
CONTRAST MEDIA
CHROMATOGRAPHY, 2011
CYSTIC FIBROSIS
LIPIDS, 2303*
LIPIDS
BILE ACIDS AND SALTS, 2534
DRUG EFFECTS ON, 2534
OBESITY, 2222
SHUNT, INTESTINAL, 2222
LIVER DISEASES, ALCOHOLIC
ACIDS, 2422
AMINO ACIDS, 2422
SECRETIN
FEEDING, 1980
TRANSPORT
VITAMIN B12, 1715*
ULCER, PEPTIC
SECRETIN, 1980
VITAMINS
COENZYMES, 1991
ZOLLINGER-ELLISON SYNDROME
SECRETIN, 1980

PNEUMATOSIS
INTESTINES, 2283

POLYPS
COLON, 2244
BIOPSY, 2242*
DIAGNOSIS, 2242*
DISEASES ASSOCIATED WITH, 2246
ENDOSCOPY, 2242*
GENETIC FACTORS, 2247
INTESTINE, SMALL, 2246
MORPHOLOGY, 2245
NEOPLASMS, BENIGN, 2246
PATHOLOGY, 2247
DUODENUM, 2207
ESOPHAGUS
DIAGNOSIS, 2094
ENDOSCOPY, 2104
PROGNOSIS, 2094
RADIOLOGY, 2094
THERAPY, 2104
GASTROINTESTINAL SYSTEM
CLASSIFICATION, 2286
ENDOSCOPY, 2104

POLYPS (continued)
GASTROINTESTINAL SYSTEM (continued)
FAMILIAL FACTORS, 2286
PRECANCEROUS CONDITIONS, 2286
THERAPY, 2104
INTESTINE, SMALL
ENDOSCOPY, 2104
THERAPY, 2104
INTESTINES, 2285
REVIEW, 2284
RECTUM
DISEASES ASSOCIATED WITH, 2121
MENETRIER'S DISEASE, 2121
STOMACH
ANEMIA, PERNICIOUS, 2158
DIAGNOSIS, 2040
DISEASES ASSOCIATED WITH, 2158
ENDOSCOPY, 2040, 2104
PRECANCEROUS CONDITIONS, 2122
THERAPY, 2104

POLYSACCHARIDES
DIARRHEA
PREVENTION, 2154
GASTRECTOMY
DIARRHEA, 2154

PORPHYRIA
DRUG THERAPY, 2354
SIMULATION
PATHOLOGY, 1917

PORTACAVAL SHUNT
AMMONIA
CLEARANCE STUDY, 1909*
METABOLISM, 1909*
COMPLICATIONS, 1909*
DIET, 2343
ENZYMES, 1909*
HYPERTENSION, PORTAL
CIRCULATION, 2454
LIVER CIRRHOSIS
HYPERTENSION, PORTAL, 2450
METABOLISM
LIPIDS, 1945
PROTEINS
METABOLISM, 1909*

PORTAL HYPERTENSION
SEE HYPERTENSION, PORTAL

POTASSIUM
DEFICIENCY
DIURETICS, 2435*
DRUG-INDUCED, 2435*
LIVER CIRRHOSIS, 2435*
ESOPHAGUS
ULCER, 2601
INTESTINE, SMALL
ULCER, 2601
PANCREAS
ELECTROPHYSIOLOGY, 1854*
SECRETION
AMYLASES, 1854*
STOMACH
ULCER, 2601

PRECANCEROUS CONDITIONS
COLITIS, ULCERATIVE
REVIEW, 2291*

PRECANCEROUS CONDITIONS (continued)
ESOPHAGUS
BARRETT'S SYNDROME, 2087
GASTROINTESTINAL SYSTEM
POLYPS, 2286
STOMACH
POLYPS, 2122

PREGNANCY
ABSORPTION
VITAMIN B12, 1742
ESOPHAGUS
MOTILITY, 1747*
SPHINCTER, 1747*
INTESTINAL ABSORPTION
VITAMIN B12, 1742
JAUNDICE, 2353

PROCTOCOLITIS
COMPLICATIONS, 2277
MORPHOLOGY, 2626

PROLAPSE
ESOPHAGUS, 2125
STOMACH, 2125

PROSTAGLANDINS
DUODENUM
ULCER, PEPTIC, 2199
ILEUM
MOTILITY, 1755*
NERVOUS CONTROL, 1755*
INTESTINE, SMALL
MOTILITY, 1755*
NERVOUS CONTROL, 1755*
PANCREAS
BICARBONATE SECRETION, 1875
CIRCULATION, 1875
STOMACH
ACID SECRETION, 1825
SECRETION, 1796*
ULCER, PEPTIC
DRUG THERAPY, 2171*

PROTEASE
SEE PEPTIDE HYDROLASES

PROTEIN-LOSING ENTEROPATHIES
CELIAC DISEASE
INTESTINAL ABSORPTION, 2223*

PROTEINS
INTESTINAL ABSORPTION
DIETARY FACTORS, 1718*
JAUNDICE, OBSTRUCTIVE, 2516
LIVER DISEASES, 2516
LIVER INJURY
HYPOXIA, 1950
METABOLISM, 1950
METABOLISM
GASTRECTOMY, 2119
HYPOXIA, 1950
PANCREAS
SECRETION, 1852*, 1867, 1878
SYNTHESIS, 1863*
PORTACAVAL SHUNT
METABOLISM, 1909*
RIBOSOMES
SYNTHESIS, 1808*

PROTEINS (continued)
SALIVA
CHROMATOGRAPHY, 1787*
ISOLATION, 1787*
SECRETION
HORMONE EFFECTS ON, 1852*, 1878
HORMONES, ADRENAL CORTEX, 1852*
SECRETIN, 1878
SYNTHESIS
DIETARY FACTORS, 1863*
HORMONE EFFECTS ON, 1808*
PENTAGASTRIN, 1808*

PURINES
INTESTINAL ABSORPTION, 1709*

PYLOROPLASTY
STOMACH
MOTILITY, 1768*

PYLORUS
ALKALINE PHOSPHATASE, 1974
CROHN'S DISEASE
STENOSIS, 2627
ENZYMES
DIGESTION, 1974
HYPERTROPHY
DIAGNOSIS, 2126
SURGERY, 2126
SURVIVAL, 2126
THERAPY, 2126
STENOSIS
DIAGNOSIS, 2126
HYPERTROPHY, 2126
INFANT, 2126
SURGERY, 2126
SURVIVAL, 2126
THERAPY, 2126
SUCRASE, 1974
ULCER, PEPTIC
PERFORATION, 2131

RADIATION
COLON
ENDARTERITIS, 2610
ILEUM
ENDARTERITIS, 2610

RADIOIMMUNOASSAY
SCHISTOSOMIASIS
ANTIGENS, 1997*
DIAGNOSIS, 1997*
TECHNIQUES, 1997*
ZOLLINGER-ELLISON SYNDROME
GASTRIN, 2000*, 2058

RADIOISOTOPES
ESOPHAGUS
MOTILITY, 2083
LIVER
SCANNING, SCINTILLATION, 2004
SCANNING, SCINTILLATION
COMPLICATIONS, 2045

RADIOLOGY
BILE DUCTS
CALCULI, 2495
OBSTRUCTION, 2495

RADIOLOGY (continued)
BILIARY TRACT
FISTULA, 2024
BUDD-CHIARI SYNDROME
CHILD, 2346
CHOLELITHIASIS
BILE DUCTS, 2471*
COLON, 2252
INFANT, 2041
TECHNIQUES, 2041, 2253
COMMON BILE DUCT CALCULI
DIAGNOSIS, 2495
CROHN'S DISEASE
DIAGNOSIS, 2624
DUODENUM
MUSCLE RELAXANTS, 2142
TECHNIQUES, 2051, 2142
ECHINOCOCCOSIS
DIAGNOSIS, 2027
ESOPHAGEAL DISEASES
MOTILITY, 2054
ESOPHAGUS
ACHALASIA, 2082
CYSTS, 2094
NEOPLASMS, BENIGN, 2054, 2095
POLYPS, 2094
GALLBLADDER DISEASES
COLON, 2501
DIAGNOSIS, 2032
GASTROINTESTINAL DISEASES
DIAGNOSIS, 2051
TECHNIQUES, 2051
GASTROINTESTINAL SYSTEM
FISTULA, 2024
HEMORRHAGE, 2034
NEOPLASMS, MALIGNANT, 2052
TECHNIQUES, 2052
INTESTINES
SALMONELLOSIS, 2578
MENETRIER'S DISEASE
DIAGNOSIS, 2123
SALIVARY GLANDS
CHILD, 2593
PATHOLOGY, 2593
REVIEW, 2593
TECHNIQUES, 2593
STOMACH
BARIUM, 2035
CONTRAST MEDIA, 2035, 2076
MOTILITY, 2056
MUSCLE RELAXANTS, 2142
TECHNIQUES, 2051, 2142
STOMACH DISEASES
MOTILITY, 2056

RADIONUCLIDES
INTESTINAL ABSORPTION
CIRCULATION, 1705*
DISTENTION, 1705*
PRESSURE STUDY, 1705*
LIVER
SCANNING, SCINTILLATION, 2430*
PANCREAS
SCANNING, SCINTILLATION, 1850*
RETICULOENDOTHELIAL SYSTEM
ABSORPTION, 2430*
SCANNING, SCINTILLATION
AMINO ACIDS, 1850*

RADIONUCLIDES (continued)
STOMACH
SECRETION, 1999*

RADIOTHERAPY
ABDOMEN
COMPLICATIONS, 2542*, 2610
COMPLICATIONS
ENDARTERITIS, 2610
GASTROINTESTINAL SYSTEM, 2542*
SURGERY, 2542*
ESOPHAGUS
HEALING, 1700
REGENERATION, 1700
MALABSORPTION SYNDROMES
DIAGNOSIS, 2225*
RECTUM
CARCINOEMBRYONIC ANTIGEN, 2249
NEOPLASMS, MALIGNANT, 2249
STOMACH
HEALING, 1700
LIVER, 2162
LIVER INJURY, 2162
NEOPLASMS, MALIGNANT, 2162
REGENERATION, 1700

RECTUM
SEE ALSO ANORECTUM
CHILD
SURGERY, 2271
CROHN'S DISEASE, 2625
INCONTINENCE
PREVENTION, 2271, 2272
MALABSORPTION SYNDROMES
BIOPSY, 2609
MOTILITY
GLUCAGON, 1759*
HORMONE EFFECTS ON, 1759*
SECRETIN, 1759*
NEOPLASM METASTASIS, 2260
NEOPLASMS
DIAGNOSIS, 2237*
THERAPY, 2262
NEOPLASMS, MALIGNANT
CARCINOEMBRYONIC ANTIGEN, 2243, 2249
DISEASES ASSOCIATED WITH, 2121
IMMUNOLOGY, 2243
LYMPHOCYTES, 2243
MENETRIER'S DISEASE, 2121
RADIOTHERAPY, 2249
THERAPY, 2261
POLYPS
DISEASES ASSOCIATED WITH, 2121
MENETRIER'S DISEASE, 2121
PRESSURE STUDY
TECHNIQUES, 1780
RADIOTHERAPY
CARCINOEMBRYONIC ANTIGEN, 2249
SCHISTOSOMIASIS, 2619
SURGERY
DIET, 2254
INCONTINENCE, 2272
TECHNIQUES, 2256

REFLUX
BILE
ANTRECTOMY, 2200
VAGOTOMY, 2200

REFLUX (continued)
DUODENUM, 1775
ESOPHAGUS
BARRETT'S SYNDROME, 2086
DRUG THERAPY, 2106
SCLERODERMA, 2106
STRICTURE, 2108
PANCREATIC DUCT, 1775
STOMACH
MOTILITY, 2069*

REGIONAL ENTERITIS
SEE ENTERITIS, REGIONAL

RESPIRATORY SYSTEM
ESOPHAGUS
SURGERY, 2078
ULCER, PEPTIC, 2113

RETICULOENDOTHELIAL SYSTEM
ABSORPTION
RADIONUCLIDES, 2430*
LIVER CIRRHOSIS
COMPLICATIONS, 2430*

RIBOFLAVIN
SEE VITAMIN B2

RIBOSOMES
PROTEINS
SYNTHESIS, 1808*
STOMACH, 1808*

RUPTURE
ESOPHAGUS
THERAPY, 2105
LIVER
CYSTS, 2620
DIAGNOSIS, 2360
THERAPY, 2360
WOUNDS AND INJURIES, 2360

SALICYLATES
STOMACH
DRUG EFFECTS ON, 1794*
ELECTROPHYSIOLOGY, 1794*
MITOCHONDRIA, 1794*

SALIVA
PANCREATITIS, CHRONIC
DIAGNOSIS, 2318, 2319
PROTEINS
CHROMATOGRAPHY, 1787*
ISOLATION, 1787*
SECRETION
DRUG EFFECTS ON, 1789
PARASYMPATHOLYTICS, 1789

SALIVARY GLANDS
DRUG EFFECTS ON
PARASYMPATHOLYTICS, 1789
ION TRANSPORT
HORMONE EFFECTS ON, 1743
HORMONES, GASTROINTESTINAL, 1743
SODIUM, 1743
NEOPLASMS
CHILD, 2594

SALIVARY GLANDS (continued)
NEOPLASMS, MALIGNANT
MORPHOLOGY, 2595
ULTRASTRUCTURE, 2595
RADIOLOGY
CHILD, 2593
PATHOLOGY, 2593
REVIEW, 2593
TECHNIQUES, 2593
SECRETION
DRUG EFFECTS ON, 1789
GLYCOPROTEINS, 1788*
PANCREATITIS, CHRONIC, 2318, 2319
TRANSPORT
HORMONE EFFECTS ON, 1743
HORMONES, GASTROINTESTINAL, 1743
SODIUM, 1743

SALMONELLOSIS
BIOCHEMISTRY, 2577
CHILD
DRUG THERAPY, 2576
DIARRHEA
ETIOLOGY, 2557
DRUG THERAPY
ANTIBIOTICS, 2576
EPIDEMIOLOGY, 2574
INTESTINES
DIAGNOSIS, 2578
RADIOLOGY, 2578
THERAPY, 2574
TRANSMISSION
ENDOSCOPY, 2575

SARCOIDOSIS
LIVER
BIOPSY, 2329*
MORPHOLOGY, 2329*
LIVER FUNCTION TESTS, 2329*

SCANNING, SCINTILLATION
CHOLECYSTITIS
DIAGNOSIS, 2499, 2521
CHOLESTASIS
DIAGNOSIS, 2528
COMPLICATIONS
PREVENTION, 2045
JAUNDICE
DIAGNOSIS, 2528
JAUNDICE, OBSTRUCTIVE
DIAGNOSIS, 2022
LIVER, 2005
COMPUTERS, 2006
NEOPLASM METASTASIS, 2348
NEOPLASMS, MALIGNANT, 2007, 2339
RADIOISOTOPES, 2004
RADIONUCLIDES, 2430*
REVIEW, 2004
TECHNIQUES, 2004, 2430*
LIVER CIRRHOSIS
DIAGNOSIS, 2430*, 2436
PANCREAS
AMINO ACIDS, 1850*
NEOPLASMS, 2308
NEOPLASMS, MALIGNANT, 2298*
RADIONUCLIDES, 1850*
RADIOISOTOPES
COMPLICATIONS, 2045

SCANNING, SCINTILLATION (continued)
RADIONUCLIDES
AMINO ACIDS, 1850*

SCHISTOSOMIASIS
ANTIGENS
RADIOIMMUNOASSAY, 1997*
DIAGNOSIS
RADIOIMMUNOASSAY, 1997*
ENZYMES, 2010
INTESTINAL ABSORPTION, 1702
INTESTINE, SMALL
ABSORPTION, 1702
MORPHOLOGY, 1702
LIVER FUNCTION TESTS, 2010
RADIOIMMUNOASSAY
TECHNIQUES, 1997*
RECTUM, 2619
THERAPY, 2618

SCLERODERMA
COLON, 2265
ESOPHAGUS
DRUG THERAPY, 2106
REFLUX, 2106

SCLEROSIS
INTESTINES
CARCINOID TUMOR, 2202*

SECRETIN
ANUS
MOTILITY, 1759*
COLON
MOTILITY, 1759*
DUODENUM
ULCER, PEPTIC, 1980
ESOPHAGUS
MOTILITY, 1774
PANCREAS
BICARBONATE SECRETION, 1871
PANCREAS FUNCTION TESTS, 2020, 2307
PLASMA
FEEDING, 1980
RECTUM
MOTILITY, 1759*
SECRETION
AMYLASES, 1853*
PROTEINS, 1878
SMOKING, 1859*
ULCER, PEPTIC
FEEDING, 1980
PLASMA, 1980
ZOLLINGER-ELLISON SYNDROME
FEEDING, 1980
PLASMA, 1980

SECRETION
SEE ALSO ACID SECRETION, BICARBONATE SECRETION, HYPERCHLORHYDRIA
AMYLASES
CALCIUM, 1853*
CERULEIN, 1853*, 1854*
CHOLECYSTOKININ, 1874
DRUG EFFECTS ON, 1853*, 1854*
HORMONE CONTROL, 1874
HORMONE EFFECTS ON, 1853*, 1858*, 1874

SECRETION (continued)
AMYLASES (continued)
POTASSIUM, 1854*
SECRETIN, 1853*
SOMATOSTATIN, 1874
ANTRUM
GASTRIN, 1801*
BILE
ADENOSINE TRIPHOSPHATASE, 1927
DRUG EFFECTS ON, 1934
HORMONE EFFECTS ON, 1868
LIPIDS, 1881*
STEROIDS, 1934
BILE ACIDS AND SALTS, 1922
ADENOSINE TRIPHOSPHATASE, 1927
BILE CANALICULI
BILE, 1927
BILE ACIDS AND SALTS, 1927
BILIARY TRACT
CONTRAST MEDIA, 1935
DRUG EFFECTS ON, 1935
LIPIDS, 1935
CELIAC DISEASE
HORMONES, 2227
DUODENUM
GASTRIN, 1801*
GASTRIN, 2150
ACID SECRETION, 1824
ADRENERGIC RECEPTOR BLOCKADERS, 1822
AGE FACTORS, 1821
AMINO ACIDS, 1802*
ANTACIDS, 2168*
DIETARY FACTORS, 1823, 1839
DRUG EFFECTS ON, 1795*, 1822, 2168*
DRUG-INDUCED, 1795*, 1805*
EPINEPHRINE, 1822
FATS, 1839
FEEDING, 1801*
GLUCOSE, 1840
H2 RECEPTOR ANTAGONISTS, 1795*
HYPERCHLORHYDRIA, 1824
INFANT, 1821
NERVOUS CONTROL, 1829, 1840
SMOKING, 1859*
STRESS, 1807*
ULCER, PEPTIC, 2165*, 2168*
VAGOTOMY, 1822
GASTROINTESTINAL DISEASES
PANCREAS, 2591
HEPATITIS, CHRONIC
PANCREAS, 2462, 2463
HEPATOCYTES
BILE ACIDS AND SALTS, 1884*
LIPASE
HORMONE EFFECTS ON, 1852*
HORMONES, ADRENAL CORTEX, 1852*
LIPIDS
DRUG EFFECTS ON, 1881*
LIPOPROTEINS
FATTY LIVER, 1947
LIVER CIRRHOSIS
PANCREAS, 2462, 2463
MUCUS
ULCER, PEPTIC, 1818
PANCREAS, 1849*, 1877
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 1872

SECRETION (continued)
PANCREAS (continued)
AMYLASES, 1853*, 1854*, 1874
CALCIUM, 1857*
DIETARY FACTORS, 1839
DRUG EFFECTS ON, 1854*, 1860*, 1866, 1867, 2310
ENZYMES, 1866, 1874
FATS, 1839
FEEDING, 1864*
GUANOSINE CYCLIC 3',5' MONOPHOSPHATE, 1872
HORMONE CONTROL, 1839, 1855*, 1869, 1873, 1874
HORMONE EFFECTS ON, 1791, 1858*, 1868, 1869, 1870, 1873, 1874, 1875, 1878
LIPASE, 1852*
NERVOUS CONTROL, 1855*
PROTEINS, 1852*, 1867, 1878
SMOKING, 1859*
WILSON'S DISEASE, 2356
PANCREATIC DUCT
CELLS, 1856*
HORMONE CONTROL, 1856*
HORMONE EFFECTS ON, 1856*
PEPSIN
DRUG EFFECTS ON, 1809*, 1813*
H2 RECEPTOR ANTAGONISTS, 1813*
HISTAMINE, 1813*
PROTEINS
HORMONE EFFECTS ON, 1852*, 1878
HORMONES, ADRENAL CORTEX, 1852*
SECRETIN, 1878
SALIVA
DRUG EFFECTS ON, 1789
PARASYMPATHOLYTICS, 1789
SALIVARY GLANDS
DRUG EFFECTS ON, 1789
GLYCOPROTEINS, 1788*
PANCREATITIS, CHRONIC, 2318, 2319
SECRETIN
SMOKING, 1859*
STOMACH
AGE FACTORS, 1821
ANTACIDS, 1835
ATROPINE, 2148
CELIAC DISEASE, 2228
CHEMICAL COMPOSITION, 1819
DRUG EFFECTS ON, 1795*, 1809*, 1848, 2148
ENTERECTOMY, 1838
FATS, 1838
GASTRIN, 1801*, 1824, 2167*
HORMONE EFFECTS ON, 1791, 1796*, 1846, 1868, 1870
INFANT, 1821
MUCUS, 1818, 1820
PARASYMPATHOLYTICS, 2148
PEPSIN, 1813*, 1835, 1848
PROSTAGLANDINS, 1796*
RADIONUCLIDES, 1999*
SURGERY, 1806*
TECHNIQUES, 1999*, 2033
ULCER, PEPTIC, 2164*

SEDATIVES
LIVER COMA, 1963
RECOVERY, 2046

SEPSIS
ENTERITIS
COMPLICATIONS, 2560
NECROSIS, 2560
ENTEROCOLITIS, NECROTIZING
COMPLICATIONS, 2560
GASTROINTESTINAL SYSTEM
PREVENTION, 2604
SURGERY, 2604

SERUM
ALBUMINS
ULCER, PEPTIC, 2550*
ZOLLINGER-ELLISON SYNDROME, 2550*
AMINO TRANSFERASES
AGE FACTORS, 2037
INFANT, 2037
NEONATE, 2037
AMYLASES
STARCH, 2607
COLITIS, ULCERATIVE
PROGNOSIS, 2288*
GASTRIN
ADRENERGIC RECEPTOR AGONISTS, 1822
ADRENERGIC RECEPTOR BLOCKADERS, 1822
AGE FACTORS, 1821
ANEMIA, PERNICIOUS, 2158
ANTACIDS, 2168*
DIETARY FACTORS, 1823
DRUG EFFECTS ON, 1822, 2168*, 2198
EPINEPHRINE, 1822
H2 RECEPTOR ANTAGONISTS, 2198
INFANT, 1821
PARASYMPATHOMIMETICS, 1822
ULCER, PEPTIC, 2168*, 2198
VAGOTOMY, 1822
LIPIDS
DIETARY FACTORS, 2482
FIBERS, 2482
LIVER DISEASES
BILE ACIDS AND SALTS, 2410
PANCREATITIS
COMPLEMENT, 2316
ULCER, PEPTIC
DRUG THERAPY, 1990
VITAMIN B6
CELIAC DISEASE, 2230

SHIGELLOSIS
DIARRHEA
ETIOLOGY, 2557

SHORT BOWEL SYNDROME
URINE
OXALATES, 2232

SHUNT, INTESTINAL
BILE
CHOLELITHIASIS, 2221
LIPIDS, 2221
BIOCHEMISTRY, 2217
COLON
CARBOHYDRATES, 2218
COMPLICATIONS, 2219
CHOLELITHIASIS, 2219
FATTY LIVER, 2220
GLUCOSE
METABOLISM, 2216

SHUNT, INTESTINAL (continued)
LIVER
FIBROSIS, 2219
NECROSIS, 2219
LIVER FUNCTION TESTS, 2220
MORPHOLOGY, 2217
NUTRITION, 2219
OBESITY
SURGERY, 2205*
THERAPY, 2205*
PLASMA
LIPIDS, 2222

SIGMOID
MALABSORPTION SYNDROMES
BIOPSY, 2609
SURGERY
TECHNIQUES, 2256

SLEEP
LIVER INJURY
OXYGEN, 1962

SMALL INTESTINE
SEE INTESTINE, SMALL

SMOKING
ESOPHAGEAL REFLUX, 1751*
ESOPHAGUS
MOTILITY, 1751*
SPHINCTER, 1751*
PANCREAS
SECRETION, 1859*
SECRETION
GASTRIN, 1859*
SECRETIN, 1859*
STOMACH
ACID SECRETION, 1859*

SODIUM
INTESTINAL ABSORPTION
HORMONE EFFECTS ON, 1738
HORMONES, GASTROINTESTINAL, 1738
INTESTINES
TRANSPORT, 1738
SALIVARY GLANDS
ION TRANSPORT, 1743
TRANSPORT, 1743

SOLVENTS
LIVER
PERFUSION, 1959

SOMATOSTATIN
ACID SECRETION
HISTAMINE, 1810*
PENTAGASTRIN, 1810*
ANTRUM
CELLS, 1698*
PANCREAS
BICARBONATE SECRETION, 1873
SECRETION
AMYLASES, 1874
STOMACH
ACID SECRETION, 1810*
CELLS, 1698*

SPASM
ESOPHAGUS
MANOMETRY, 2073*
SURGERY, 2073*
THERAPY, 2073*

SPHINCTER
ANUS
PRESSURE STUDY, 1780
ESOPHAGEAL DISEASES
INFANT, 2055
ESOPHAGUS
ATRESIA, 2061*
FISTULA, 2061*
HORMONE EFFECTS ON, 1747*, 1774
MANOMETRY, 1744*
MOTILITY, 1744*, 1746*, 1748*, 1750*, 1774
PREGNANCY, 1747*
PRESSURE STUDY, 1748*, 1750*, 2099
SMOKING, 1751*

SPLEEN
LIVER CIRRHOSIS, 2467
TRANSPLANTATION, 1986*

SPRUE, TROPICAL
DIETARY FACTORS, 2224

STARCH
SERUM
AMYLASES, 2607

STARVATION
INTESTINES
ENZYMES, 1976
NEONATE, 1976

STEATORRHEA
PANCREATITIS, CHRONIC
DISEASES ASSOCIATED WITH, 2322

STEATOSIS
SEE FATTY LIVER

STENOSIS
CROHN'S DISEASE
PYLORUS, 2627
ESOPHAGUS
DILATATION, 2110
ENDOSCOPY, 2110
NEOPLASMS, MALIGNANT, 2110
PYLORUS
DIAGNOSIS, 2126
HYPERTROPHY, 2126
INFANT, 2126
SURGERY, 2126
SURVIVAL, 2126
THERAPY, 2126
VATER'S AMPULLA
ENDOSCOPY, 2523
HEMATOBILIA, 2336
SURGERY, 2523

STEROIDS
CHOLESTASIS
DRUG-INDUCED, 1885*
HEPATITIS, NONVIRAL
DRUG-INDUCED, 2367

STEROIDS (continued)
JAUNDICE
DRUG-INDUCED, 2367
LIVER COMA
DRUG THERAPY, 2424
THERAPY, 2424
LIVER DISEASES, ALCOHOLIC
DRUG THERAPY, 2424
THERAPY, 2424
SECRETION
BILE, 1934
TRANSPORT
BILE ACIDS AND SALTS, 1885*

STEROLS
BILE, 1929
EXCRETION
APPETITE DEPRESSANTS, 1992
DRUG EFFECTS ON, 1992

STOMACH
ACID SECRETION, 1826
ACIDITY, 2165*
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 1847
AGE FACTORS, 1821
AMINO ACIDS, 1802*
ANTRECTOMY, 2200
ATROPINE, 1804*
BILE, 1837
CELIAC DISEASE, 2228
CHLORIDES, 1812*
DIETARY FACTORS, 1839
DRUG EFFECTS ON, 1795*, 1804*, 1809*, 1813*, 1825, 1836, 1841, 1842, 1843, 1844, 1848, 2181, 2197
ELECTROPHYSIOLOGY, 1811*
FATS, 1837, 1839, 2172*
GASTRIN, 1828, 1841
GUANOSINE CYCLIC 3',5' MONOPHOSPHATE, 1847
H2 RECEPTOR ANTAGONISTS, 1795*, 1813*, 1825, 1841, 1842, 1844, 2197
HISTAMINE, 1813*, 1841, 1843, 1844
HORMONE CONTROL, 1839
HORMONE EFFECTS ON, 1828, 1843, 1846
HORMONES, GASTROINTESTINAL, 1846
INFANT, 1821
INTESTINE, SMALL, 2201*
NERVOUS CONTROL, 2172*
PANCREAS, 1837
PROSTAGLANDINS, 1825
REVIEW, 1811*
SMOKING, 1859*
SOMATOSTATIN, 1810*
ULCER, PEPTIC, 2164*, 2165*, 2180, 2181, 2188, 2201*
VAGOTOMY, 1790, 2140, 2182, 2187, 2193, 2200
ACIDITY
ANTACIDS, 1834
DRUG EFFECTS ON, 1834
ULCER, PEPTIC, 2165*
VAGOTOMY, 2193

STOMACH (continued)
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE
ACID SECRETION, 2163*
ANEMIA, PERNICIOUS, 2163*
DRUG EFFECTS ON, 2163*
GASTRIN, 2163*
HORMONE EFFECTS ON, 2163*
NEOPLASMS, MALIGNANT, 2163*
SECRETAGOGUES, 2163*
STOMACH DISEASES, 2163*
ULCER, PEPTIC, 2163*
ZOLLINGER-ELLISON SYNDROME, 2163*
ADENOSINE TRIPHOSPHATE
ASPIRIN, 1794*
DRUG EFFECTS ON, 1794*
ADENYL CYCLASE
DRUG EFFECTS ON, 1845
HISTAMINE, 1845
HORMONE EFFECTS ON, 1845
AMINO ACIDS
PARENTERAL ALIMENTATION, 1968
BEZOARS
DIABETES, 2111*
BILE
WOUNDS AND INJURIES, 1814*
BILE ACIDS AND SALTS
METABOLISM, 1736
BIOPSY
TECHNIQUES, 2038
BLEEDING
DIAGNOSIS, 2049
DRUG-INDUCED, 1832
DRUG THERAPY, 1842
ENDOSCOPY, 2049
H2 RECEPTOR ANTAGONISTS, 1842
BURNS, CHEMICAL, 2147
CELLS
GASTRIN, 1798*
MITOSIS, 1817
MORPHOLOGY, 1989
CHOLECYSTOKININ, 1800*
DRAINAGE
SURGERY, 2139
TECHNIQUES, 2139
DRUG EFFECTS ON
ANALGESICS AND ANTIPYRETICS, 1832
ANTI-INFLAMMATORY AGENTS, 1831, 1832
ASPIRIN, 1794*, 1831, 1832
ATROPINE, 2148
CHELATING AGENTS, 1831
L-DOPA, 1832
PARASYMPATHOLYTICS, 2148
SALICYLATES, 1794*
ELECTROPHYSIOLOGY
ASPIRIN, 1793*, 1794*
DRUG EFFECTS ON, 1793*, 1794*
SALICYLATES, 1794*
ENZYMES
FOOD, 1973
HISTOCHEMISTRY, 1816
EPINEPHRINE
NEUROMUSCULAR DISEASES, 2124
GASTRIN, 1800*
ANEMIA, PERNICIOUS, 2158
CELLS, 1799*
FEEDING, 1801*
MITOSIS, 1824
SURGERY, 1806*

STOMACH (continued)
GUANOSINE CYCLIC 3',5' MONOPHOSPHATE
NEOPLASMS, MALIGNANT, 2163*
H2 RECEPTOR ANTAGONISTS
BILE, 1814*
HEALING
RADIATION EFFECTS ON, 1700
RADIOTHERAPY, 1700
HEMORRHAGE
LASER, 1827
LIVER CIRRHOSIS, 2455
SURGERY, 2159, 2551
SURVIVAL, 2159
THERAPY, 1827
HISTOCHEMISTRY
ANEMIA, 2602
HORMONE CONTROL
MOTILIN, 1765*, 1766*
HORMONE EFFECTS ON
MOTILIN, 1765*
HYPERCHLORHYDRIA
MITOSIS, 1824
HYPERTROPHY
DRUG-INDUCED, 1795*
H2 RECEPTOR ANTAGONISTS, 1795*
INTESTINAL ABSORPTION
FATS, 1736
ION TRANSPORT
ASPIRIN, 1793*
CHLORIDES, 1812*
DRUG EFFECTS ON, 1793*
STRESS, 1807*
IRRADIATION
MOTILITY, 1770*
MITOCHONDRIA
ASPIRIN, 1794*
DRUG EFFECTS ON, 1794*
SALICYLATES, 1794*
MITOSIS
HORMONE CONTROL, 1803*
MORPHOLOGY
ANALGESICS AND ANTIPYRETICS, 1832
ANEMIA, 2602
ANTI-INFLAMMATORY AGENTS, 1831, 1832
ASPIRIN, 1831, 1832
CHELATING AGENTS, 1831
L-DOPA, 1832
DRUG EFFECTS ON, 1831, 1832
FOOD, 1973
TECHNIQUES, 1989
VAGOTOMY, 1790
MORPHOMETRY
DRUG EFFECTS ON, 1795*
MOTILITY
DIABETES, 2111*
DRUG EFFECTS ON, 1769*, 1784
ELECTROPHYSIOLOGY, 1763*
FOOD, 1761*, 1762*
GLUCOSE, 1777
HIATAL HERNIA, 2069*
HORMONE CONTROL, 1764*, 1765*, 1766*
HORMONE EFFECTS ON, 1764*, 1765*
HORMONES, GASTROINTESTINAL, 1764*
INSULIN, 1770*
MOTILIN, 1765*, 1766*
NERVOUS CONTROL, 1783
PYLOROPLASTY, 1768*
STOMACH (continued)
MOTILITY (continued)
RADIOLOGY, 2056
REFLUX, 2069*
SURGERY, 2183
TECHNIQUES, 1760*, 1779, 2042
ULCER, PEPTIC, 1769*, 2164*
VAGOTOMY, 1768*
MUCUS
ENDOSCOPY, 1703
NEOPLASMS
BIOPSY, 2057
DIAGNOSIS, 2057
NEOPLASMS, MALIGNANT, 2122
AGE FACTORS, 2151
DIAGNOSIS, 2040
ENDOSCOPY, 2040
GASTRECTOMY, 2149
GASTRIN, 2112*
HYPERCALCEMIA, 1797*
PROGNOSIS, 2152
RADIOTHERAPY, 2162
SURVIVAL, 2152
NERVOUS CONTROL
VAGOTOMY, 1767*
NOREPINEPHRINE
NEUROMUSCULAR DISEASES, 2124
NUCLEIC ACIDS
GASTRIN, 1803*
HORMONE EFFECTS ON, 1803*
SYNTHESIS, 1824
OBSTRUCTION, 2133
PEPSIN
ANTACIDS, 1835
DRUG EFFECTS ON, 1848
PERMEABILITY
ASPIRIN, 1793*
DRUG EFFECTS ON, 1793*
POLYPS
ANEMIA, PERNICIOUS, 2158
DIAGNOSIS, 2040
DISEASES ASSOCIATED WITH, 2158
ENDOSCOPY, 2040, 2104
THERAPY, 2104
PRECANCEROUS CONDITIONS
POLYPS, 2122
PROLAPSE, 2125
RADIOLOGY
BARIUM, 2035
CONTRAST MEDIA, 2035, 2076
MUSCLE RELAXANTS, 2142
TECHNIQUES, 2051, 2142
RADIOTHERAPY
LIVER, 2162
LIVER INJURY, 2162
REGENERATION
RADIATION EFFECTS ON, 1700
RADIOTHERAPY, 1700
RIBOSOMES, 1808*
SECRETION
AGE FACTORS, 1821
ANTACIDS, 1835
ATROPINE, 2148
CELIAC DISEASE, 2228
CHEMICAL COMPOSITION, 1819
DRUG EFFECTS ON, 1795*, 1809*, 1848, 2148
ENTERECTOMY, 1838
FATS, 1838

STOMACH (continued)
SECRETION (continued)
GASTRIN, 1801*, 1824, 2167*
HORMONE EFFECTS ON, 1791, 1796*, 1846, 1868, 1870
INFANT, 1821
MUCUS, 1818, 1820
PARASYMPATHOLYTICS, 2148
PEPSIN, 1813*, 1835, 1848
PROSTAGLANDINS, 1796*
RADIONUCLIDES, 1999*
SURGERY, 1806*
TECHNIQUES, 1999*, 2033
ULCER, PEPTIC, 2164*
SOMATOSTATIN
CELLS, 1698*
SURGERY
COMPLICATIONS, 2114, 2117, 2138, 2145, 2153, 2154
DIARRHEA, 2154
DUMPING SYNDROME, 2114
ESOPHAGEAL REFLUX, 2145
NUTRITION DISORDERS, 2153
TECHNIQUES, 2143
TISSUE CULTURE
TECHNIQUES, 1799*
TRANSPORT
CHLORIDES, 1812*
ULCER
ASPIRIN, 1830
BLEEDING, 2129
CHELATING AGENTS, 1831
CHLORIDES, 2601
DRUG-INDUCED, 1830, 1831, 2601
HEMORRHAGE, 1827
HISTAMINE, 1830
HISTOCHEMISTRY, 2129
POTASSIUM, 2601
STRESS, 1792*, 1807*
ULCER, PEPTIC
CHILD, 2118, 2130
COMPLICATIONS, 2175
DIAGNOSIS, 2040
DISEASES ASSOCIATED WITH, 2155
DRUG THERAPY, 1842, 2181
ENDOSCOPY, 2040, 2127
ETIOLOGY, 2127
H2 RECEPTOR ANTAGONISTS, 1842
PERFORATION, 2131, 2175
SURVIVAL, 2178
ULTRASTRUCTURE
VAGOTOMY, 1767*, 2186

STOMACH DISEASES
DIAGNOSIS
ENDOSCOPY, 2033, 2040
DRUG-INDUCED
ANTIHYPERTENSIVE AGENTS, 2134
DRUG THERAPY
H2 RECEPTOR ANTAGONISTS, 1842
MOTILITY
DIAGNOSIS, 2056
RADIOLOGY, 2056
STOMACH
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 2163*

STRESS
DUODENUM
ION TRANSPORT, 1807*

STRESS (continued)
DUODENUM (continued)
ULCER, 1807*
GASTROINTESTINAL SYSTEM
ULCER, 2132
HEPATECTOMY
REGENERATION, 1907*
LIVER
REGENERATION, 1907*
SECRETION
GASTRIN, 1807*
STOMACH
ION TRANSPORT, 1807*
ULCER, 1792*, 1807*
ULCER
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 1792*
GUANOSINE CYCLIC 3',5' MONOPHOSPHATE, 1792*
PERFORATION, 2132

STRICTURE
ESOPHAGEAL REFLUX
REVIEW, 2108
SURGERY, 2108
ESOPHAGUS
DILATATION, 2077, 2109
ENDOSCOPY, 2109
PROGNOSIS, 2107
REFLUX, 2108
REVIEW, 2108
SURGERY, 2107, 2108
THERAPY, 2109

SUCRASE
BLIND LOOP SYNDROME, 1965*
INTESTINE, SMALL, 1974
PYLORUS, 1974

SUCROSE
MALABSORPTION SYNDROMES, 2234
GROWTH FACTORS, 2233

SUGAR
SEE CARBOHYDRATES

SULFHYDRYL COMPOUNDS
BLOOD
CHROMATOGRAPHY, 2432*
LIVER CIRRHOSIS, 2432*
LIVER COMA, 2432*
CHROMATOGRAPHY
TECHNIQUES, 2432*

SULFOBROMOPHTHALEIN
CLEARANCE STUDY
CHOLESTASIS, 2525
INFANT, 2525
HEPATITIS
CLEARANCE STUDY, 2395
LIVER FUNCTION TESTS, 2395
HEPATITIS, INFECTIOUS
CLEARANCE STUDY, 2395
LIVER FUNCTION TESTS, 2395
LIVER
CLEARANCE STUDY, 2525
TRANSPORT, 1939
TRANSPORT
DRUG EFFECTS ON, 1939

TEMPERATURE
LIVER
BIOCHEMISTRY, 1911
PERFUSION, 1911

TERPENES
CHOLELITHIASIS
DRUG THERAPY, 2511

THIAMINE
SEE VITAMIN B1

TISSUE CULTURE
ANTRUM
TECHNIQUES, 1799*
GASTRIN
CELLS, 1799*
STOMACH
TECHNIQUES, 1799*

TOMOGRAPHY
COMPUTERS
REVIEW, 2053
GALLBLADDER DISEASES
DIAGNOSIS, 2032
PANCREATIC DISEASES
DIAGNOSIS, 2001*, 2017, 2039

TOXICITY
BILE ACIDS AND SALTS
DRUG EFFECTS ON, 1928
LIVER
ACIDS, 1914
BILE ACIDS AND SALTS, 1921
CARCINOGENS, 1898*
DRUG METABOLISM, 1913

TOXINS
COLITIS
ETIOLOGY, 2240*
DIARRHEA
ETIOLOGY, 2557

TRANQUILIZING AGENTS
LIVER
OXYGEN, 1910

TRANSAMINASE
SEE AMINO TRANSFERASES

TRANSFERRIN
INTESTINAL ABSORPTION
IRON, 1729

TRANSFUSION
AMINO TRANSFERASES, 2330*
AUSTRALIA ANTIGEN, 2330*
HEPATITIS, 2331*
HEPATITIS, SERUM, 2331*
LIVER CIRRHOSIS, 2331*
LIVER DISEASES, 2330*, 2331*
LIVER FUNCTION TESTS, 2330*

TRANSPLANTATION
DUODENUM, 1986*
KIDNEYS, 1986*
COMPLICATIONS, 2241*, 2541*
ESOPHAGITIS, 2541*
HEMORRHAGE, 2541*

TRANSPLANTATION (continued)
KIDNEYS (continued)
HEPATITIS, 2541*
INTESTINAL OBSTRUCTION, 2541*
PANCREATITIS, 2541*
PERFORATION, 2541*
LIVER, 1986*
TECHNIQUES, 2359, 2587
PANCREAS, 1986*
SPLEEN, 1986*

TRANSPORT
BILE
DRUG EFFECTS ON, 1881*
BILE ACIDS AND SALTS
DRUG EFFECTS ON, 1885*
STEROIDS, 1885*
BILIARY TRACT
BILE ACIDS AND SALTS, 1882*
BILIRUBIN
DRUG EFFECTS ON, 1939
COLON
FATTY ACIDS, 1737
DUODENUM
BICARBONATES, 1713*
CHLORIDES, 1713*
ELECTROLYTES, 1707*
IRON, 1734
ELECTROLYTES
HORMONE EFFECTS ON, 1708*
HORMONES, GASTROINTESTINAL, 1708*
HEPATOCYTES
BILE ACIDS AND SALTS, 1885*
INTESTINE, LARGE
ELECTROLYTES, 1708*
INTESTINE, SMALL
IMMUNOGLOBULINS, 1719*
IRON, 1733, 1734
VITAMIN B1, 1723*, 1732
INTESTINES
CARBOHYDRATES, 1716*
HORMONE EFFECTS ON, 1738
PHOSPHATES, 1721*
SODIUM, 1738
WATER, 1738
IRON
MITOCHONDRIA, 1733
JEJUNUM
CELIAC DISEASE, 1717*
GLUCOSE, 1717*, 1735
HORMONE EFFECTS ON, 1739
UREA, 1741
UREMIA, 1741
WATER, 1704*, 1731
LIVER
BILE ACIDS AND SALTS, 1882*
BILIRUBIN, 1939
SULFOBROMOPHTHALEIN, 1939
LYMPHATIC SYSTEM
FATS, 1725*
PLASMA
VITAMIN B12, 1715*
SALIVARY GLANDS
HORMONE EFFECTS ON, 1743
HORMONES, GASTROINTESTINAL, 1743
SODIUM, 1743
STOMACH
CHLORIDES, 1812*

TRANSPORT (continued)
SULFOBROMOPHTHALEIN
DRUG EFFECTS ON, 1939
VITAMIN B1
ALCOHOLISM, 1732

TRAUMA
SEE STRESS, WOUNDS AND INJURIES

TRIGLYCERIDES
SEE ALSO FATS, LIPIDS
BILE ACIDS AND SALTS
METABOLISM, 1948
CYSTIC FIBROSIS
ABSORPTION, 2303*
LIVER
FATTY LIVER, 1951

TYPHOID
SEE SALMONELLOSIS

ULCER
ANTRUM
ASPIRIN, 1830
DRUG-INDUCED, 1830
HISTAMINE, 1830
DUODENUM
DRUG-INDUCED, 1805*
STRESS, 1807*
ESOPHAGUS
CHLORIDES, 2601
DRUG-INDUCED, 2601
POTASSIUM, 2601
GASTROINTESTINAL SYSTEM
STRESS, 2132
HEMORRHAGE
LASER, 1827
THERAPY, 1827
INTESTINE, SMALL
CHLORIDES, 2601
DRUG-INDUCED, 2601
POTASSIUM, 2601
STOMACH
ASPIRIN, 1830
BLEEDING, 2129
CHELATING AGENTS, 1831
CHLORIDES, 2601
DRUG-INDUCED, 1830, 1831, 2601
HEMORRHAGE, 1827
HISTAMINE, 1830
HISTOCHEMISTRY, 2129
POTASSIUM, 2601
STRESS, 1792*, 1807*
STRESS
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 1792*
GUANOSINE CYCLIC 3',5' MONOPHOSPHATE, 1792*
PERFORATION, 2132

ULCER, PEPTIC
ABSORPTION
H2 RECEPTOR ANTAGONISTS, 2174, 2177
ACID SECRETION
DISTENTION, 2166*
DRUG EFFECTS ON, 2181
VAGOTOMY, 2187

ULCER, PEPTIC (continued)
CHILD
DIAGNOSIS, 2130
ETIOLOGY, 2118, 2130
CHOLECYSTITIS
DISEASES ASSOCIATED WITH, 2128
COMPLICATIONS
ENDOTOXINS, 2131
DISEASES ASSOCIATED WITH
CHOLECYSTITIS, 2128
EPIDEMIOLOGY, 2173
UREMIA, 2170*, 2196
DRUG THERAPY, 1836
H2 RECEPTOR ANTAGONISTS, 1842, 2170*, 2176, 2192
PROSTAGLANDINS, 2171*
SERUM, 1990
DUODENUM
ACID SECRETION, 2165*, 2187, 2188
ANTRECTOMY, 2189
CHILD, 2118
COMPLICATIONS, 2192
DISEASES ASSOCIATED WITH, 2128, 2155
DRUG THERAPY, 2169*, 2192, 2198
ENDOSCOPY, 2128
H2 RECEPTOR ANTAGONISTS, 2198
PERFORATION, 2179, 2192
PROSTAGLANDINS, 2199
RECURRENCE, 2185
SECRETIN, 1980
SURVIVAL, 2178
VAGOTOMY, 2182, 2184, 2185, 2187, 2189
GASTRECTOMY
COMPLICATIONS, 2144
DIAGNOSIS, 2043
ENDOSCOPY, 2043
RECURRENCE, 2194
GASTRITIS
DISEASES ASSOCIATED WITH, 2155
H2 RECEPTOR ANTAGONISTS
METABOLISM, 2174
HEMORRHAGE
DIAGNOSIS, 2190
ENDOSCOPY, 2190
JEJUNUM
GASTRECTOMY, 2144
PANCREAS
MORPHOLOGY, 2023
PEPSIN
DISTENTION, 2166*
PERFORATION
COMPLICATIONS, 2131
H2 RECEPTOR ANTAGONISTS, 2192
SURGERY, 2179
THERAPY, 2175, 2179
PLASMA
SECRETIN, 1980
PYLORUS
PERFORATION, 2131
RECURRENCE
DRUG THERAPY, 2194
H2 RECEPTOR ANTAGONISTS, 2194
RESPIRATORY SYSTEM, 2113
SECRETIN
FEEDING, 1980
SECRETION
GASTRIN, 2165*, 2168*

ULCER, PEPTIC (continued)
SECRETION (continued)
MUCUS, 1818
SERUM
ALBUMINS, 2550*
GASTRIN, 2168*, 2198
STOMACH
ACID SECRETION, 2164*, 2165*, 2180, 2181, 2188, 2201*
ACIDITY, 2165*
ADENOSINE CYCLIC 3',5' MONOPHOSPHATE, 2163*
CHILD, 2118, 2130
COMPLICATIONS, 2175
DIAGNOSIS, 2040
DISEASES ASSOCIATED WITH, 2155
DRUG THERAPY, 1842, 2181
ENDOSCOPY, 2040, 2127
ETIOLOGY, 2127
H2 RECEPTOR ANTAGONISTS, 1842
MOTILITY, 1769*, 2164*
PERFORATION, 2131, 2175
SECRETION, 2164*
SURVIVAL, 2178
SURGERY
COMPLICATIONS, 2195
GASTRITIS, 2195
UREMIA
DRUG THERAPY, 2170*
H2 RECEPTOR ANTAGONISTS, 2170*
VAGOTOMY
RECURRENCE, 2185

ULCERATIVE COLITIS
SEE COLITIS, ULCERATIVE

ULTRASONOGRAPHY
CHOLECYSTITIS
DIAGNOSIS, 2521
CHOLELITHIASIS
DIAGNOSIS, 2514
COMMON BILE DUCT CALCULI
DIAGNOSIS, 2477
LIVER
NEOPLASMS, MALIGNANT, 2007
VEINS, 2468*
PANCREAS
NEOPLASMS, 2019
PANCREATIC DISEASES
DIAGNOSIS, 2001*, 2015, 2039
PANCREATITIS, CHRONIC
COMPLICATIONS, 2018
DIAGNOSIS, 2018
TECHNIQUES, 2015

UREA
INTESTINAL ABSORPTION
UREMIA, 1741
JEJUNUM
TRANSPORT, 1741
LIVER
SYNTHESIS, 1888*
SYNTHESIS
DIETARY FACTORS, 1888*

UREMIA
INTESTINAL ABSORPTION
UREA, 1741

UREMIA (continued)
JEJUNUM
TRANSPORT, 1741
LIVER
DRUG METABOLISM, 1892*
ULCER, PEPTIC
DISEASES ASSOCIATED WITH, 2170*, 2196
DRUG THERAPY, 2170*
H2 RECEPTOR ANTAGONISTS, 2170*

URINARY SYSTEM
JAUNDICE, OBSTRUCTIVE
ISCHEMIA, 1906*

URINE
ALPHA FETOPROTEIN, 1897*
CONTRAST MEDIA
CHROMATOGRAPHY, 2011
OXALATES
GASTROINTESTINAL DISEASES, 2232
LIVER DISEASES, 2232
PANCREATIC DISEASES, 2232
SHORT BOWEL SYNDROME, 2232

VACCINES
HEPATITIS, 2397, 2398

VAGOTOMY
ABSORPTION
CARBOHYDRATES, 2154
BILE
REFLUX, 2200
COMPLICATIONS
DIARRHEA, 2154, 2191
DIARRHEA
PREVENTION, 2154
THERAPY, 2191
DUODENUM
ULCER, PEPTIC, 2182, 2184, 2185, 2187, 2189
GASTRITIS, 2200
SECRETION
GASTRIN, 1822
SERUM
GASTRIN, 1822
STOMACH
ACID SECRETION, 1790, 2140, 2182, 2187, 2193, 2200
ACIDITY, 2193
MORPHOLOGY, 1790
MOTILITY, 1768*
NERVOUS CONTROL, 1767*
ULTRASTRUCTURE, 1767*, 2186
ULCER, PEPTIC
ACID SECRETION, 2187
RECURRENCE, 2185

VARICES
ESOPHAGUS
HEMORRHAGE, 2458
HYPERTENSION, PORTAL, 2458
SURGERY, 2074*
THERAPY, 2074*

VASOACTIVE INTESTINAL PEPTIDE
SEE HORMONES, GASTROINTESTINAL

VASOPRESSIN
INTESTINAL ABSORPTION, 1739

VATER'S AMPULLA
BIOPSY
TECHNIQUES, 2531
NEOPLASMS, MALIGNANT
DISEASES ASSOCIATED WITH, 2490
ENDOSCOPY, 2523
SURGERY, 2523
STENOSIS
ENDOSCOPY, 2523
HEMATOBILIA, 2336
SURGERY, 2523

VEINS
LIVER
OBSTRUCTION, 2468*
ULTRASONOGRAPHY, 2468*
OBSTRUCTION
DIAGNOSIS, 2468*

VIRUSES
ENTERITIS
ION TRANSPORT, 1697*
HEPATITIS
INFECTION, 1903*
HEPATITIS, CHRONIC
ETIOLOGY, 2418
HEPATITIS, SERUM
INFECTION, 1903*

VITAMIN A
GLUCONEOGENESIS
DRUG EFFECTS ON, 1904*
LIVER
DRUG EFFECTS ON, 1904*

VITAMIN B1
INTESTINAL ABSORPTION, 1722*
ALCOHOLISM, 1732
ALCOHOLS, 1723*
DRUG EFFECTS ON, 1723*
INTESTINE, SMALL
ALCOHOLISM, 1732
TRANSPORT, 1723*, 1732
TRANSPORT
ALCOHOLISM, 1732

VITAMIN B6
DUODENUM
CELIAC DISEASE, 2230
SERUM
CELIAC DISEASE, 2230

VITAMIN B12
ABSORPTION
PREGNANCY, 1742
ANEMIA, PERNICIOUS
DIAGNOSIS, 2547*
INTESTINAL ABSORPTION, 2547*
MALABSORPTION SYNDROMES, 2156
FATTY LIVER
THERAPY, 2427
INTESTINAL ABSORPTION, 1715*
LIVER CIRRHOSIS, 2466
PREGNANCY, 1742
INTESTINE, SMALL
ABSORPTION, 1742

VITAMIN B12 (continued)
MALABSORPTION SYNDROMES
ETIOLOGY, 2156
PLASMA
TRANSPORT, 1715*

VITAMIN C
BILE ACIDS AND SALTS
SYNTHESIS, 1940
CHOLESTEROL
METABOLISM, 1940
INTESTINAL ABSORPTION, 1740
KIDNEYS
ABSORPTION, 1740

VITAMIN D
INTESTINAL ABSORPTION
PHOSPHATES, 1721*

VITAMIN E
LIVER
DEFICIENCY, 1893*

VITAMIN K
JAUNDICE, OBSTRUCTIVE
DRUG THERAPY, 2516
LIVER DISEASES
DRUG THERAPY, 2516

VITAMINS
COENZYMES
ALCOHOLISM, 1991
PLASMA
COENZYMES, 1991

VOLVULUS
SEE INTESTINAL OBSTRUCTION

VOMITING
DRUG-INDUCED, 1752*
INTESTINES
MOTILITY, 1752*
IRRADIATION
INSULIN, 1770*

WATER
GALLSTONES, 2484
INTESTINAL ABSORPTION, 1704*
CHOLESTEROL, 1731
FATTY ACIDS, 1731
HORMONE EFFECTS ON, 1738
HORMONES, GASTROINTESTINAL, 1738
INTESTINES
TRANSPORT, 1738
JEJUNUM
TRANSPORT, 1704*, 1731

WATER, ELECTROLYTE BALANCE
INTESTINES
CHOLERA, 1728*
ENTEROTOXINS, 1728*

WILSON'S DISEASE
COPPER
METABOLISM, 2356
DIAGNOSIS
HEMOLYSIS, 2357
JAUNDICE, 2357
LIVER CIRRHOSIS, 2357

WILSON'S DISEASE (continued)
LIPIDS
CHOLESTEROL, 2358
METABOLISM
CHOLESTEROL, 2358
PANCREAS
COPPER, 2356
SECRETION, 2356
SURGERY
CIRCULATION, 2337
THERAPY, 2608

WOUNDS AND INJURIES
BILE
STOMACH, 1814*
LIVER
BLEEDING, 2361
DIAGNOSIS, 2360
GLYCOGEN, 1953
RUPTURE, 2360
SURGERY, 2361
THERAPY, 2360, 2361

YERSINIA
ENTEROCOLITIS
ANTIGENS, 2580
BIOCHEMISTRY, 2580
GEOGRAPHICAL FACTORS, 2580

ZINC
DEFICIENCY
LIVER COMA, 2419

ZOLLINGER-ELLISON SYNDROME
DIAGNOSIS
ALBUMINS, 2550*
TECHNIQUES, 2000*
GASTRIN
RADIOIMMUNOASSAY, 2000*, 2058
PLASMA
SECRETIN, 1980
SECRETIN
FEEDING, 1980
SERUM
ALBUMINS, 2550*
STOMACH
ADENOSINE CYCLIC 3',5'
MONOPHOSPHATE, 2163*

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